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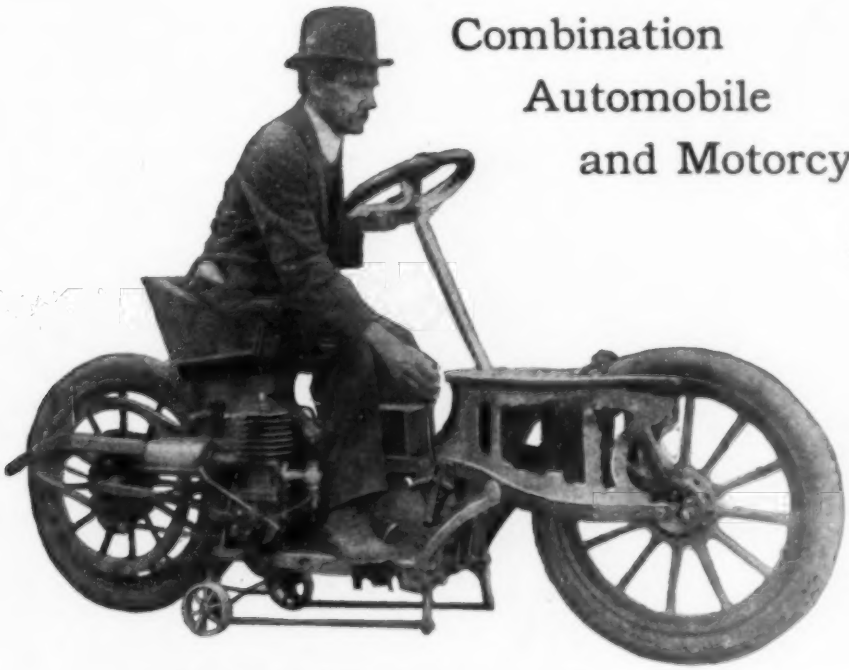
Popular Mechanics

Written So You Can Understand It

Vol. 13 MARCH No. 3

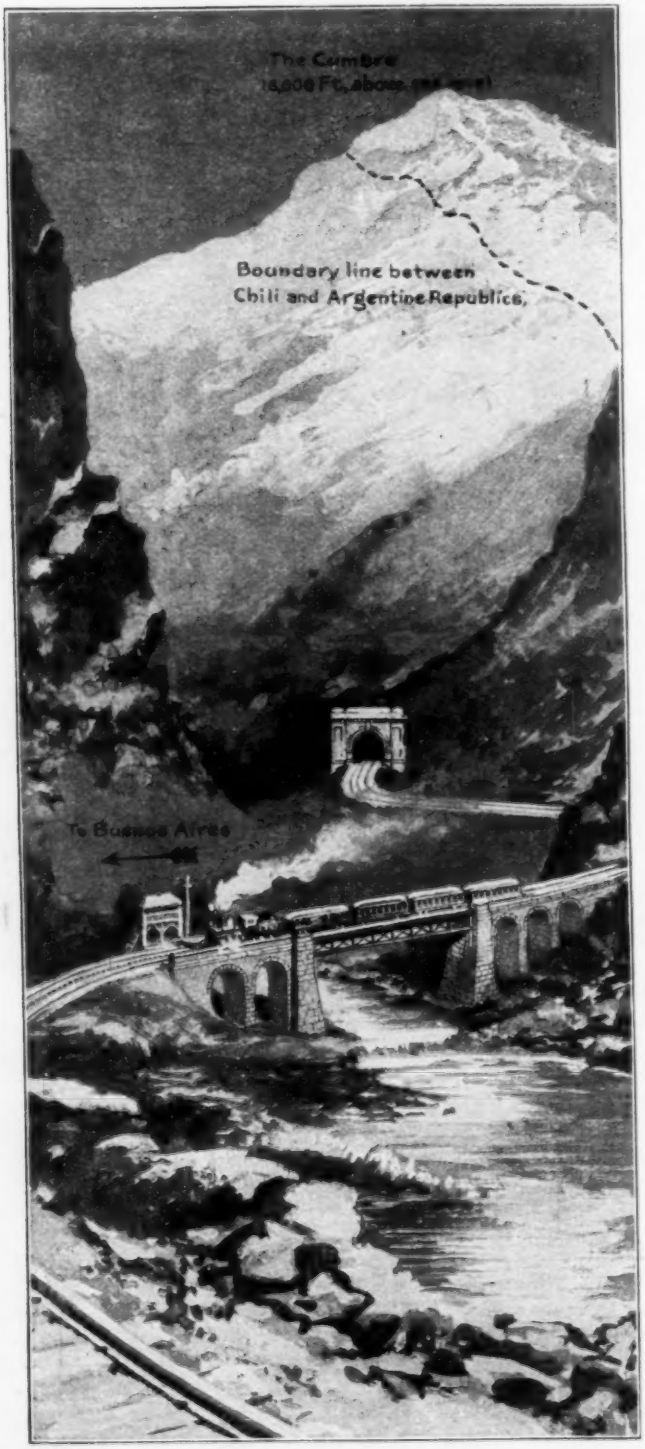
Combination Automobile and Motorcycle



The Small Wheels Keep Machine Upright When at a Standstill

A motorcycle that is as much a small but healthy automobile as it is a motorcycle has been evolved by combining several features of both. The machine is the property of a Los Angeles inventor, and its actual automobile parts are its two large wheels, the steering wheel, and the bucket seat. The pair of little wheels seen in the illustration are to keep the machine upright when it is brought to a stop. These are arranged in such a manner that pulling the steering wheel down into position for steering lifts them a couple of inches off the ground. When a stop is to be made, the steering wheel and post is pushed forward and the little wheels come in contact with the road surface again.

The 2-cylinder, 10-hp. engine drives the curious vehicle at a speed of from 4 to 40 miles an hour.



The Tunnel Through the Andes

THE TUNNEL THROUGH THE ANDES

The recent completion of the 10,000-ft. tunnel which cuts its way through the Andes and connects the Atlantic and Pacific oceans by railroad provides an unbroken line between Buenos Ayres on one edge of the continent and Valparaiso at the other.

The task of constructing the tunnel was one of the most difficult in railroad history. At the great elevation of 10,500 ft. above sea level the air was found so rarefied that the use of steam locomotives in the construction work was found difficult, and compressed air locomotives had to be used. The work of construction was commenced about four years ago.

RAPID CABLE SERVICE

Owing to the five hours' difference between New York and London time, the English stock exchange closes just an hour after the American exchange opens. Consequently it is of the utmost importance that intercommunication between the two great financial centers be as rapid as possible.

How the cable station in the London exchange meets this condition is interesting. In the operating room the receiving and transmitting apparatus is arranged for duplex working with Morse recorders, and communicates through repeating

stations with Ireland, whence the cables run to Newfoundland and on to New York. In the ordinary course of communication only one set of apparatus is in use, the other being held in reserve, with operators at all four. The cablegrams are short, and the addresses are often only one letter. The messages are received and written down by ear, are instantly passed to the decoding room, and thence are shot through tubes to the floor of the exchange and the court. Two receiving operators are stationed at each instrument, and as soon as one message is taken down by one operator, the other is writing down the next message. As many as 200 messages have been taken down in this manner in 10 minutes, which is said to be the quickest receiving ever recorded.

An Improved Mine Stretcher

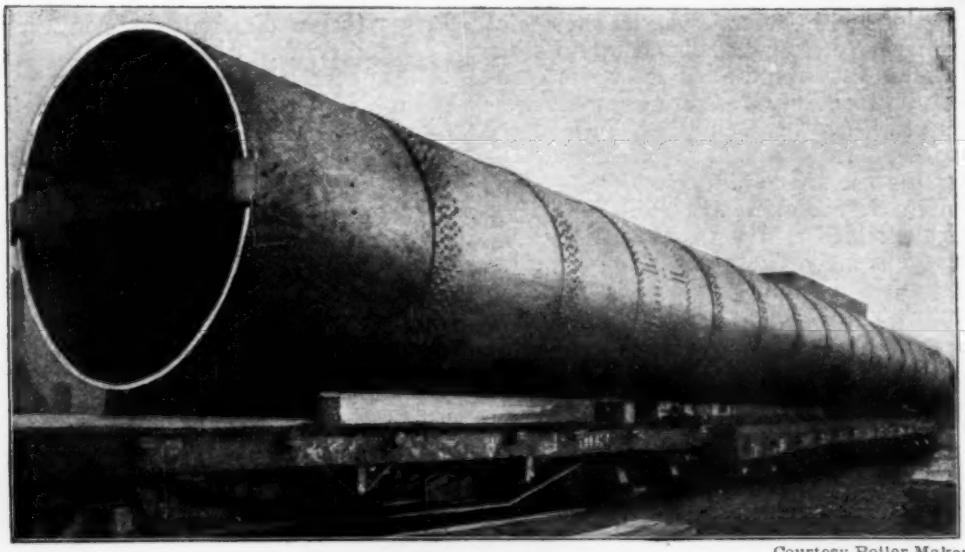
COAL TRAIN A MILE LONG

The longest loaded string of railroad cars ever pulled by one engine passed over the Virginia railroad between Roanoke, Va., and Norfolk recently. It consisted of 120 steel coal cars, each 44 ft. long, and each loaded with 50 tons of coal. From the cowcatcher of the engine to the rear of the caboose, the train measured 60 ft. more than a mile long, and the value of the load was $18,000.

The coal carrying roads of the east have all been striving to make new records for trains drawn by one locomotive during the past year. Before the record run above mentioned, a New York Central engine was leading in the competition, having hauled a train of 108 loaded 50-ton coal cars over the Pennsylvania division between Clearfield and Avis, a distance of 103 miles. Still another heavy run was recorded when the Virginian Railroad hauled a train of 107 such cars from Victoria to Sewall's Point, Virginia, a distance of 125 miles.

OXYGEN-EQUIPPED MINE STRETCHER

It sometimes happens in mine disasters that miners are rescued from gas-filled levels in such a weak or injured condition that stretchers must be employed for their removal. For just such conditions is this oxygen-equipped stretcher provided. Attached to one end are the oxygen tanks, and the helmet is a canvas sack into which the injured man's head and shoulders are placed. The opening of the bag can then be tightly laced or strapped around the waist.



Courtesy Boiler Maker

Monster Steel Cylinder on Three Cars

SHIPPING 130-FT. PIPE IN ONE PIECE

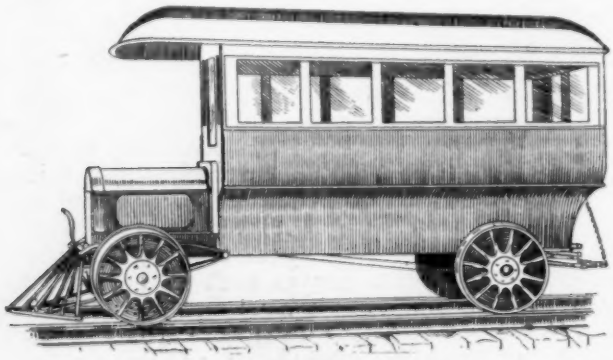
The shipping of this great length of steel cylinder in one piece necessitated much scheming and at least one special flat car. Although 130 ft. long, 15 ft. in diameter, and weighing nearly 100 tons, it was safely mounted on three flat cars and transported from Chicago to a point in Missouri, but the feat required special swivel saddles to rest the cylinder in, one flat car 60 ft. long, and two flat cars each 40 ft. long. The saddles were made to swivel so as to allow the cars and pipes to round curves, the center car acting only as an idler. This car was a special ordered from St. Louis.

The cylinder, which is made of ¾-in. plate, is to be used as a cement kiln, and when in use will be rotated at a speed of six revolutions per minute. It will revolve within two heavy cast-steel riding rings, located near each end.

AUTOMOBILE STREET-CAR

A suburban railway which connects New Orleans and Mandeville has the ordinary roadway used by electric railways, but its rolling-stock consists of specially designed steam automobiles, railway wheels taking the place of the usual pneumatic tire wheels, and a coach or bus type of body taking the place of the ordinary truck body.

The line is 16 miles long, the seating capacity of each of the cars used is 22 passengers, and each car is provided with a 30-hp. engine. The cost of maintaining such a line is said to effect a saving over the regular electric railway maintenance.



A Steam Auto as Suburban Car

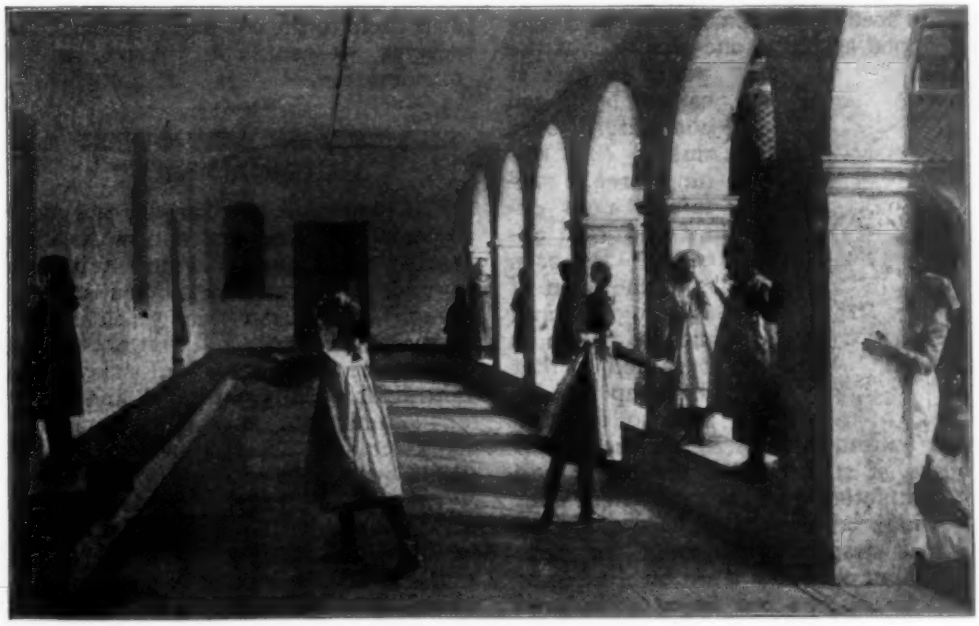
GAMES AND ATHLETIC SPORTS FOR THE BLIND

Throwing the Hammer

Putting the Shot

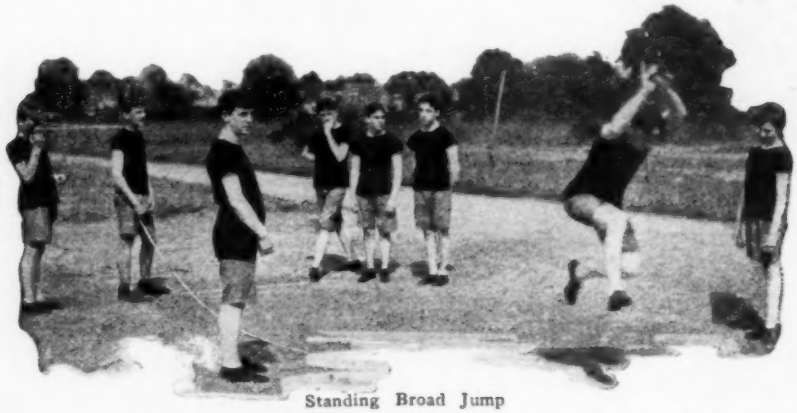
That the affliction of being blind does not make impossible the participation in athletics by members of blind educational institutions with their more blessed brothers of the ordinary preparatory school and college is being continually borne out.

The Kentucky institution for the education of the blind has had a football team that proved itself capable of winning games from many less-afflicted teams of the same weight, while a recent issue of this magazine described in illustration and story the method by which blind athletes run races. The



Blind Girl's Buff

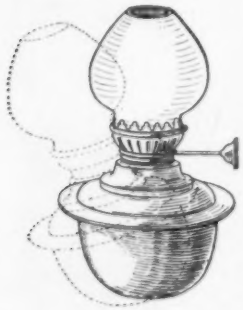
accompanying illustrations show blind students in the standing broad jump, throwing the hammer, and putting the shot at the Pennsylvania institution for the instruction of the blind. Another illustration shows girl students playing a game of "blind man's buff" in the cloister of the college. This is the genuine game, through the regrettable fact that a handkerchief is not required to make the game possible.



Standing Broad Jump

NON-TIPPING LAMP

To call this lamp "non-tipping" would seem paradoxical, because it may be tipped as far as one pleases, but the point is that it cannot be tipped completely over unless the tipping force is sustained and exerted continuously. Its base is in the form of a half globe and the bottom is weighted so that the lamp will tip just so far and then automatically right itself. Of course, if struck hard enough, it will go completely over, but a moment later it swings back onto its base again.



It is designed especially for bedrooms, an ordinary lamp on a table or chair beside the bed being considered dangerous.

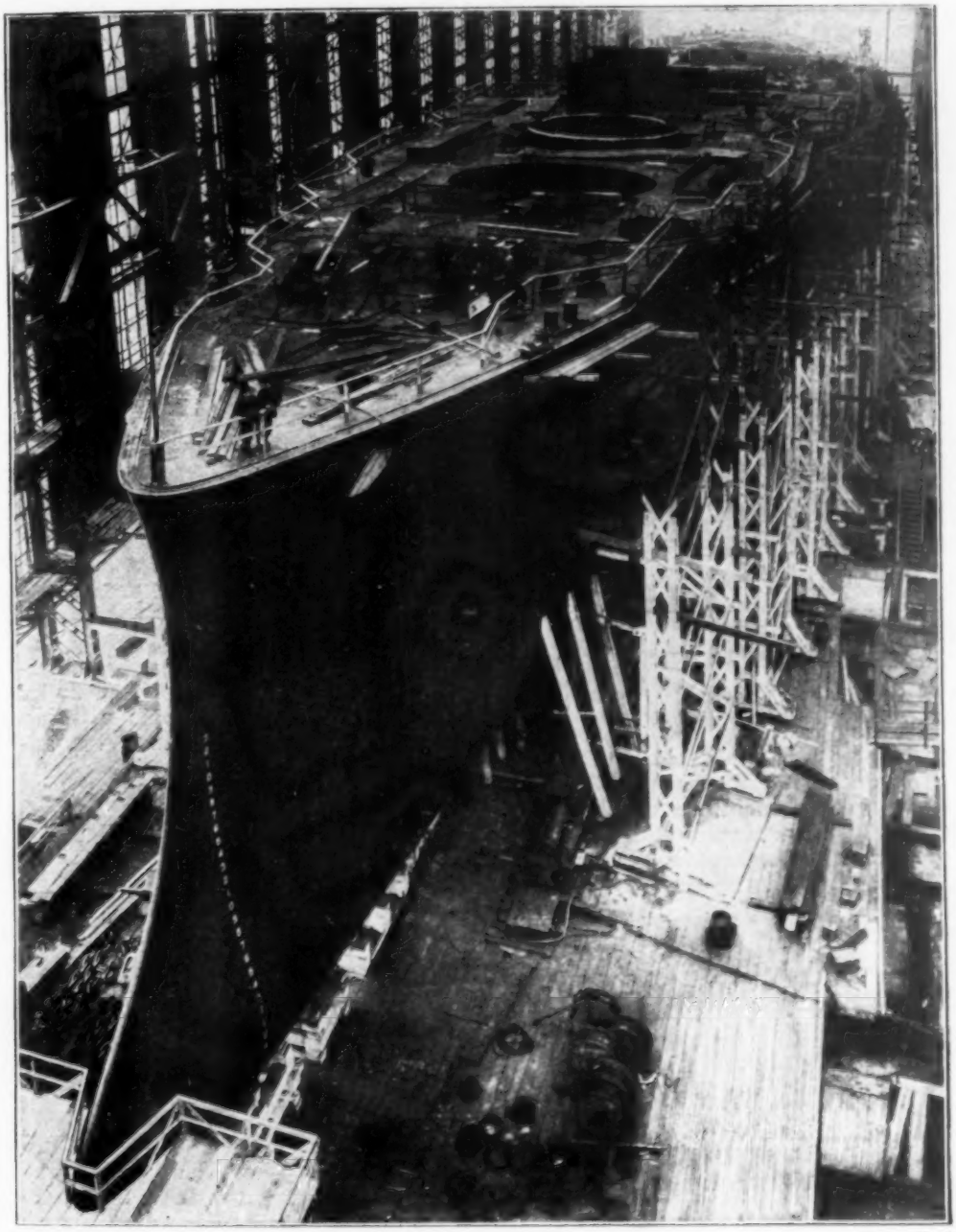
WHISKY REGAINED FROM BARRELS

A Cincinnati concern that deals in old barrels finds considerable profit in turning over the whisky barrels received to a distillery. There the barrels are filled with steam under a slight pressure, which draws out the considerable quantity of whisky the wood has absorbed. The resultant liquor is then re-distilled.

The distillery simply rents the barrels long enough to gain from them the whisky they absorbed, and then returns them to the old-barrel dealer, who receives 30 cents per barrel as his consideration.

THE "UTAH," NEW QUEEN OF AMERICAN NAVY

The newest of our "largest and most powerful" battleships is now a huge floating workshop in which hundreds of mechanics and electricians are engaged. The "Utah" was launched recently at Camden, N. J., but the evolution of the great steel hull into a real fighting ship, fully equipped, and ready for commission, is still a matter of many months. She is the fifth of the all-big-gun ships of the United States Navy to be launched, and is credited with the distinction of being the most formidable yet. There are two ships in the new program of battleship construction which will surpass her, however.



Copyright, 1909, by Walter Huff

The "Utah," Our Largest Sea Fighter, Just Before the Launching

The "Utah" is 510 ft. in length on the load water line, 88 ft. in breadth, and will have a displacement of 21,825 tons. She is expected to make a speed of 20¾ knots. The main battery will consist of ten 12-in. and sixteen 5-in. guns. The larger guns will be placed in five turrets, two of which will be for-

ward, one amidships, and two aft. She will also have two 21-in. submerged torpedo tubes.

Ten turbines, six for ahead and four for astern, capable of developing 28,000 hp., will be installed. Coal or oil may be used as fuel.

THE IMMUTABLE LAW OF PROGRESS

That a man must move forward or move backward, that he cannot stand still and hold his place in a progressive world, is an axiom, which, applied in an abstract manner, is easily understood. The world moves ahead under the feet of the man who is marking time, and whose back is turned to advancement.

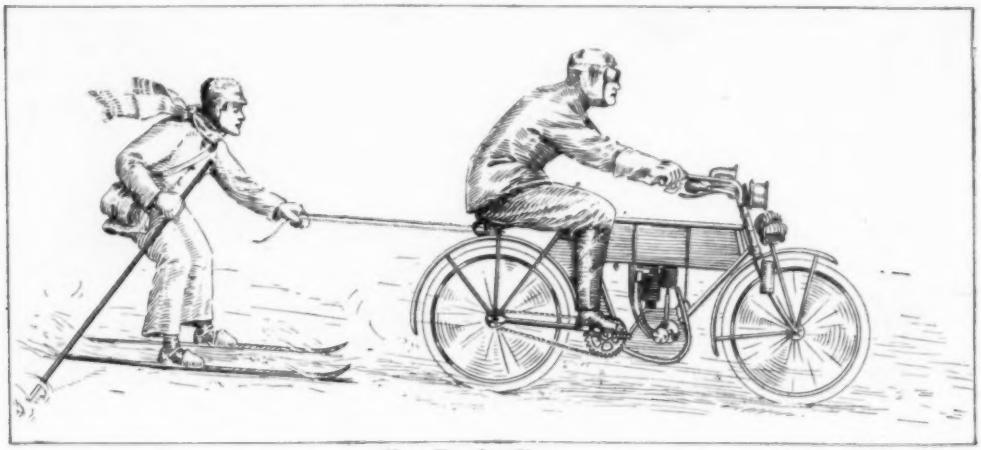
No army ever won a great battle by marking time indefinitely. Everything in the world must advance or retrograde.

The application of this law was brought out in a strikingly clear manner recently by the manager of a large and successful hostelry, according to the Hotel World.

The manager had succeeded in making for the hotel a reputation second to none. His innovations were criticized by some of his heads of departments, but the manager understood his business. His chief clerk had held his position for five years and was a faithful, reliable, but self-satisfied employe.

His self-satisfaction was his downfall. He was discharged.

"You have been filling the position with ability and fidelity," said the manager in dismissing him, "You are about as good a man in your position as ever, but no better. Everything with you has become a matter of habit. You



New Use for Skees

SKEEING BEHIND MOTORCYCLE

Skeeing is a sport for hilly country, or in places where great chutes have been erected for the purpose, but that skees provide the American boy with diversions other than intended is shown by the accompanying illustration. Skees are also excellent substitutes for sleds in catching rides on vehicles of any nature.

INGENIOUS LEMON SQUEEZER

Many devices have been invented with which to squeeze the juice from half lemons, but this little clip is designed to press the juice from the sections into which a lemon is cut for serving with tea, oysters, etc. It keeps the fingers from being soiled, and the juice drops where desired instead of squirting over the tablecloth.

are like an automaton, a machine, and this fact helps to make you reliable. It is of great value to this business to have a man so reliable and trustworthy in so important a position.

"But I am improving the hotel, introducing new features, new methods of management. I must have a man who is not the same today as he was five years ago. I need a man who joins in the spirit which I am trying to arouse. You are not. You are not welcoming new ideas, not taking the initiative in any new line of thought or endeavor that means improvement. You are altogether too well satisfied, willing to go along in the same old way, day after day. No man can take this attitude and not retrograde.

"You see, you have done nothing that seriously unfits you for the position you have so long filled, but in line with my endeavor you do not recognize or appreciate the effort I am making here to keep things up to the front, and you do not think along that line sufficiently to give me that co-operation, assistance and support which I must have from the heads of the departments."

And the chief clerk knew the manager was right.

RAILWAY CAR OVERGROWN BY TREE

One of the most novel relics of the period during which France attempted to build the Panama Canal, as well as one of the most remarkable instances of perverted tree growth ever recorded, is shown in this illustration. It is a tropical tree that completely overgrew a railway car that had been worn out and cast aside. As the first cars were taken to the Isthmus not more than 26 years ago, the tree must have grown in less than that time.

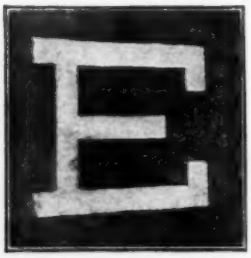
Tree That Embraces a Railway Car

MODEL OF SPOKANE BRIDGE

Some time ago mention was made in this magazine of the proposed reinforced concrete bridge at Spokane, Wash., which is to have the longest arch of any bridge of the type yet constructed. This illustration shows a "marblecrete" model of the bridge executed by Walter O. Brown. The main arch is to have a span of 281 ft.

Unlike the majority of bridge models, which are backed up, and show only the face lines, this model is an exact reproduction in every detail.

To Be Largest Concrete Arch



The Letter "E" as Sent

The Transmission of

French and German Scientists Make Remarkable Progress in Sending of Images—Success Assured by Brilliant Beginning—Many Wonderful Possibilities Opened Up by New Art

"HELLO, John, you're looking well today," is the morning salutation a man in New York may make to his friend in Chicago over the television-telephone within a few years.

And that will be no joke either.

For the possibility of being able to see the person with whom you are talking on the long-distance telephone is no idle dream. It has passed the stage of a Jules Verne prophecy, for while the famous French author conceived wonderful inventions in his fertile imagination, science has actually made a brilliant beginning in the transmission of vision, and it is already with us.

The realization of the process as one of the useful arts is but a matter of continued development. A few attempts have already been made at sending photographs over the wire, and while the result has not been all that could be wished, has served to demonstrate the practicability of the process. A vista of wonderful possibilities is opened by the advances made in television and photo-telegraphy. And it must be kept in mind that there is a radical difference between the two systems. While television aims to transmit either photographs or living images, the other is meant to send photographs only.

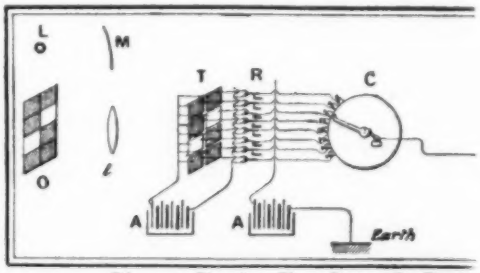
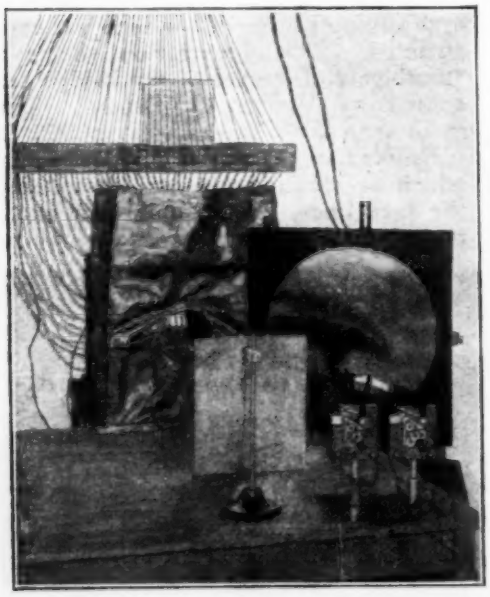


Diagram Showing How Image Is Trans-



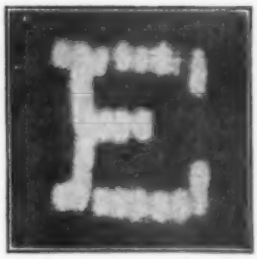
The Apparatus Used at the Transmitting End, Showing the Round Mirror, Lamps, Object Attached to Stand, and the Lens Which Projects Image of Object onto Selenium Frame, Which Is Covered.

In Europe a new international figure springs into fame in a day. Simultaneously with the appearance of the news in the daily papers of the United States his photograph is published. The cable which bears the dispatch telling the story may be used to transmit the man's image. Or it may yet come by wireless.

A crime has been committed. Quick action on the part of the police of the entire country is necessary to apprehend the perpetrator. Within a few hours his photograph is in the hands of the police of San Francisco as well as New York, and his chances of escape are small. Just as the great press as-

Vision by Electricity

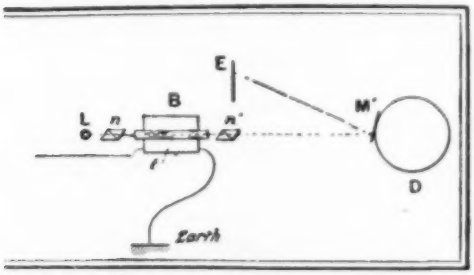
Selenium, an Element Which Conducts Electricity Only When Subjected to Light, the Secret of Discoveries—Shades Translated into Currents and Back to Shades



The Letter "E" as Received

sociations now distribute the news of the world they may furnish the daily papers with photographs.

The idea of transmitting vision has attracted scientists for years and in many countries they are striving to solve the problem. Earnest Ruhmer, a distinguished electrician of Berlin, has been working on it for a long time and has perfected a system which he



mitted from Sending Station to Receiver

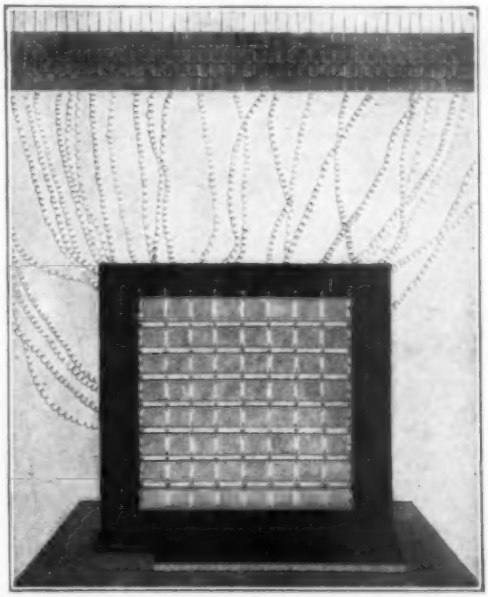
will exhibit at Brussels this year. Working along almost identical lines are George Rignoux and M. A. Fournier, of France.

The secret of both efforts rests in the almost human powers of selenium, a nonmetallic element, analogous to sulphur in its compounds. It offers a very feeble resistance to electric currents if it is subjected to light, a powerful resistance if not lighted, and degrees of resistance corresponding with the degrees of light.

The element which plays such an all-important part in the new art was discovered by Johann Berzelius, a renowned Swedish chemist, in 1817. To him we are also indebted for the discovery of thorium and cerium as well as for many of the analytical processes now in use. Though not very abundant in nature, the element enters into the composition of many minerals and has been found in the free state in certain parts of Mexico.

Rignoux and Fournier have two sets of instruments. The first is for demonstration only, establishing the principle, but having too many wires to be practical. The second has two wires only, one for the varying currents carrying the image of the object sent, and the other to regulate the operation of the instruments of both ends.

Stripped of the maze of technical terms in which such an intricate electro-chemical process is generally enmeshed it may be described as a method by which the varying shades of a black and white object may be taken, piece by piece, and transmitted by means of currents corresponding in



The Frame with Selenium Cells, Wires Connecting with Each Cell

strength with their shades to a receiver which retranslates the currents back to the shades and places them in their original positions.

The diagram in the center of the page will aid in a better understanding of the process. At the transmitting station is a frame provided with cells of selenium. By means of a strong light (L), a mirror (M), and a lens (l), the image of the object (O) is projected on the selenium cell frame (T). The cells on which the light falls permit a current of electricity to pass, but the cells which are not lighted by the projected image resist the passage of electricity and there is no current.

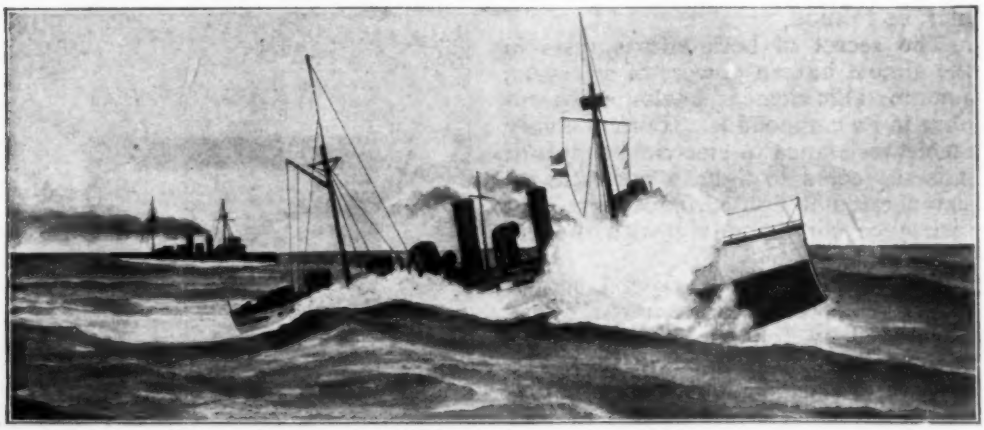
Each cell is connected with a wire. A collector, (C) receives each wire in a separate confine. On the inside a wheel turns very rapidly, gathering the currents of the wires in turn and transmitting them over the single wire connecting the sending and receiving instruments. This wire is thus incessantly traveled by many variations of current. The problem is to collect them as fast as they are shot over the wire, transform the currents to shades of black and white, and put them in their respective places in relation to the whole object, transforming them from electrical to luminous vibrations.

Rignoux and Fournier accomplish this in the following manner:

At the receiving station there is a luminous source (L), the rays of which are polarized by the prism of a Nicol polarizer (n), pass through a tube of carbonate of sulphur (t), placed in the middle of a bobbin for rotatory magnetic polarization (B), and a prism analyzer (n'). The light is more or less abundant in proportion to the current, which at that moment comes over the wire to the bobbin. These luminous vibrations are received upon a disc with mirrors (D), the rotation of which is regulated to coincide with the rotation of the collector at the transmitting station by means of the special wire. This gives to the mirrors (M') certain positions in order that each luminous vibration may be reflected in its turn in correct position upon the screen (E).

The currents are received, one after another, in rapid succession, and placed until the entire image of the object sent has been again set up.

With such a beginning it is only necessary to increase the number of selenium cells in the frame until there are thousands of them, so that the transmission of the image of a person standing in front of the instrument will be possible. Once the process has reached such a stage of development the transmission of color may follow just as color photography has evolved from its mother art.



This extraordinary illustration is a snap-shot taken from the deck of a sister ship while a squadron of the British navy was steaming through a heavy sea. A swell caught H. M. S. "Pegasus" and lifted her up while at the same moment the crest of the wave burst over her, burying everything forward of the quarter deck under hundreds of tons of water.

THREE NATIONS MAY RACE FOR SOUTH POLE

Regardless of the fact that the entire world presumed that the United States would be satisfied with the honor of reaching the North Pole, it is now probable that an Antarctic expedition is to be launched under the auspices of the National Geographic Society of Washington. If this is the case, the world will soon see England, France, and the United States struggling to reach the goal.

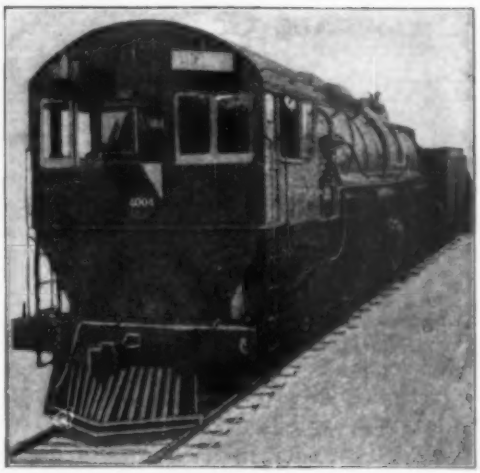
France is already represented somewhere within the Antarctic zone by Dr. Jean Charcot, who sailed from Rio de Janeiro in 1908, and England is sending an expedition under Captain Scott.

HUGE LOCOMOTIVE WITH CAB IN FRONT

When two oil-burning, Mallet compound locomotives were delivered to the Southern Pacific system last year this magazine described them as the largest and most powerful locomotives in the world, and drew attention to the newest features of their construction.

These huge locomotives proved so successful that 15 more were ordered, and in the completion of these has been introduced still another feature quite revolutionary in steam-locomotive practice, although usually adopted in the construction of electric locomotives.

This feature is none other than the placing of the firebox and engine cab foremost instead of at the rear of the boiler. The tender, however, is at the rear, which, with oil as a fuel, involved no serious difficulty. The purpose of this radical change is to have the engine crew in such a position as will afford them the clearest view of the track, a most excellent practice, especially where numerous curves, tunnels, and snowsheds abound.



View of Cab from the Front

The cab, which is entirely inclosed, is fitted with sliding windows and is entered by side doors reached by suitable ladders. A side view of the locomotive would give to the casual observer the idea that by some mistake the tender was fastened to the front of the engine instead of the rear, but a closer observation would bring home the fact that what has always been the forward end of a steam locomotive has in this instance become the rear.

The illustrations show the appearance of the locomotive from side and front views.

A glass factory at Baccara, France, has produced a new glass that will not break. The composition of the glass is heated to boiling point and then is plunged into water brought to a freezing point. The glass will be used for safety lamp tubes.

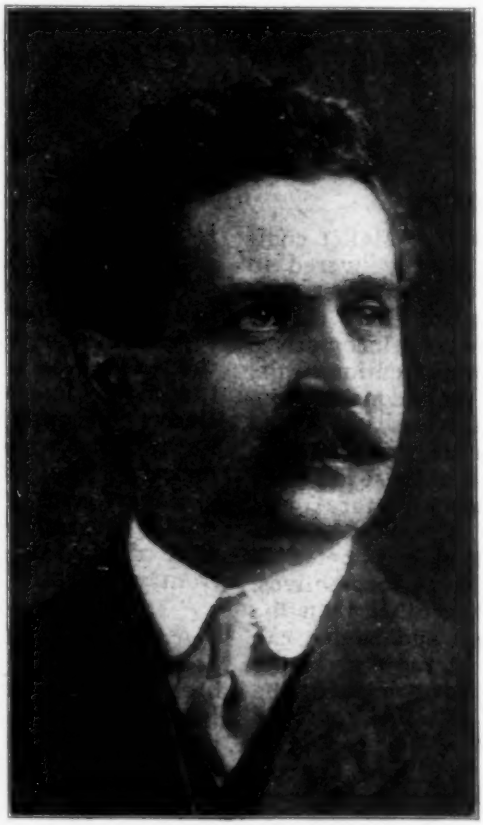
Side View of Inverted Locomotive

How the Government is Solving Our Fuel Problem

By GEORGE OTIS SMITH, Director U. S. Geological Survey

(Editor's Note—There is probably no question confronting the United States more far-reaching in its importance than that of our fuel supply. Mr. Smith, as director of the Geological Survey, is the leading figure in the effort of the Government to solve the problem, and consequently his words on the subject are golden. Since his article was received, the Survey, reviewing the work of the year 1909, has issued the following warning: "Reports received from all of the coal mining regions tend to confirm a statement frequently made in reports of the U. S. Geological Survey—that the development of coal mining properties is far in advance and in excess of the present requirements—and emphasize the need of some kind of state or federal restriction in the interest of the safety of life and of the conservation of our material resources.")

THE fuel problem today is much more clearly understood by consumers of coal and the general public than ever before. The general apathy on this question has given way to an inquiring mood. The questions now being asked are, "How long will the coal last? What will the country do if coal gets scarce, or becomes exhausted?"



George Otis Smith

A number of factors are responsible for this general awakening on the part of the public. Most prominent of these were the statements made by the Geological Survey, showing that the coal production in the United States has doubled each decade; that the production in 1908 was 406,000,000 tons; that the waste in the mining of this coal was between 225,000,000 and 250,000,000 tons; that according to the best authorities, the easily accessible coal may be exhausted about the middle of the next century.

This latter statement, of course, is contingent upon a great many things that may happen in the future. It is expected that, as time passes, powerful extraneous influences will come to bear on coal production, and, as far as can be seen, all except possible exports, are in favor of lengthening the life of the supply. As soon as the end appears in sight, the price will rise and production diminish, and that progressively. This interference with the law of decreasing increase, produced by growing scarcity, will of course prolong the life of our coal reserves, but at the same time will greatly hamper the industries dependent on this fuel.

The estimate as to the time of exhaustion of the coal was made in behalf of the Conservation Commission, which held its important meeting the early part of this year, the deliberation of this meeting serving to bring before the public in a more forcible manner than ever before, the seriousness of the situation, and the

necessity for some remedy. Incidentally, the threatened exhaustion of the coal brought out the power possibilities that lie in the waterways of the country, and also suggested other means of producing power.

All of this has resulted in a vigorous demand for more information concerning coal, and how it may be utilized. It has resulted also in focusing attention upon the coal lands still owned by the Federal Government in the western states, and also in Alaska. This public demand for information has brought out the estimated values of the rich coal lands in Alaska, and has shown the efforts being made by the Federal Government to classify the coal lands of the west according to their values. All of this, of course, has been known to the officers of the government, and the momentousness of the problem realized, but the revelations to the public have been almost amazing, and have assured the hearty co-operation of the public in the conservation of the valuable mining lands still in the public domain.

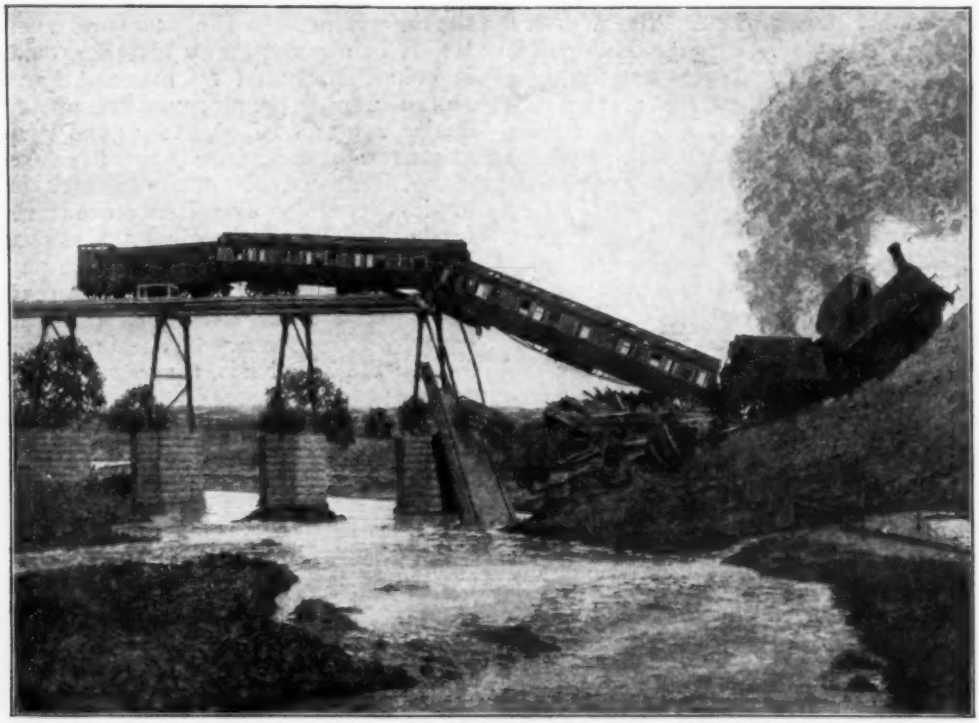
The public have not stopped at this, but have taken up the solution of at least one phase of the problem themselves, the utilization of coal. They have shown intense interest in the work being done by the Geological Survey testing station at Pittsburg, where coal is being tested under boilers, in the gas producer to operate gas engines and in the form of briquets. The tests on the gas engines, showing the development of a horsepower on one-third as much coal as is used in the average steam engine has attracted much attention, and has resulted in the installation of quite a number of large gas engines throughout the country. This will undoubtedly be one factor in conserving the fuel supply. The testing of coal under boilers has shown the operators of steam engines how much better results can be obtained than they thought were possible, which will also prove a factor in saving the coal. The briquetting tests, showing the possibility of coking the lignite of the west, which from its nature, cannot stand transportation, and is, therefore, practically useless, have called forth much favorable comment from that section of the country. If the experiments are successful, a large part of the west will be given a fuel supply which never could be depended upon before.

For some time the Federal Government has been purchasing most of its fuel on what is known as the British thermal unit basis, or according to its heating value. In the past, and even today, in a great many instances coal is being purchased by manufacturers and others on the reputation of the dealer, a method that has proven very unsatisfactory; in fact, it has been declared that the American farmer in buying fertilizer exercises more care, for he demands a chemical analysis of the fertilizer before he consents to pay for it. This new method has spread over the country, and according to many who are now purchasing their fuel on the heat basis, they have saved money by getting coal suitable for their furnaces and paying for just what they got. Before they adopted this basis, they often paid for coal which was undesirable and unfit for their furnaces, and there was no redress. Under the B. t. u. basis, if the dealer supplies coal with more heat units and less ash than is called for in the specifications, he gets a premium. If the heat units are less, and the ash is more, there is a penalty. Certain municipal departments in New York and Boston are now purchasing their coal on this basis, and New York shows one instance where the purchase of the highest priced coal in three bids offered, actually saved the city several thousand dollars in the heat units that were delivered.

So great has been the interest in the fuel problem in general that the Boston Chamber of Commerce appointed a committee of experts sometime ago, which went into the question thoroughly, detailing the number of tons consumed in the New England States, the cost of this coal at the mines, the cost of transportation and a full description of the method of buying on

the British thermal unit basis. Other cities throughout the country are now taking up this question and many of the large corporations are now buying their coal according to the heat units it contains. Altogether, the people's awakened interest in the fuel problem will undoubtedly result in a greater conservation of the supply than otherwise would have been possible.

first of the two passenger cars, fortunately of the long type, spanned it as shown by the illustration. The only passenger in the first car was an old lady who escaped with hardly a scratch. The engineer and fireman were both shot out of the cab but landed so safely that they were both at work a few minutes later rescuing the passengers from the two cars.



Frightful Appearing, But Non-Fatal Wreck Courtesy Australasian Traveller

AUSTRALIAN TRAIN WRECK

That a train wreck of this nature can occur without anyone being killed or even badly injured surpasses all wonders, yet railroad history has chronicled many such. This accident took place on a bridge which spanned a creek near Clunes, on the line between Ballarat and Maryborough, Australia. A flood in the creek caused part of the bridge to collapse, with the result that the next train over it, running in the dark, was wrecked. The engine and tender completely jumped the gap, while the

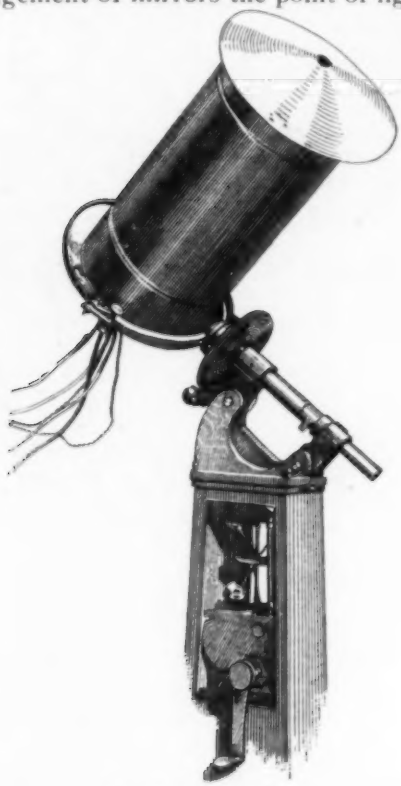
MEASURING THE HEAT OF SUN AND STARS

The two novel instruments shown in these illustrations are devices for measuring the heat rays which reach the earth from the heavenly bodies. The small instrument is an electric thermometer used in the measurement of the sun's rays. In the base is a clock mechanism which slowly turns the cylinder so that it will continually face the sun in its daily travel from east to west. The rays enter the hole of the cylinder, and the apparatus within

measures the heat by means of the electric wires seen running into its base.

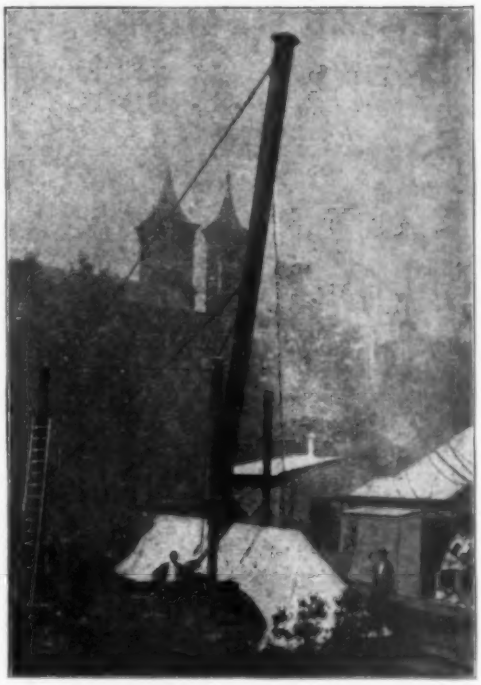
The mean distance of the sun from the earth is some 92,500,000 miles, and its rays reach us in a little more than eight minutes. Next to the sun, the nearest star, "Alpha Centauri," is four years of light travel away, and until recently scientists believed it absolutely impossible to weigh the almost infinitesimal fraction of a degree of temperature radiated to the earth from such a distance. This, however, has now been made possible by the delicate mechanism of the tall telescope-like tube shown in the other illustration.

It is located at the Smithsonian institute, and through its ingenious arrangement of mirrors the point of light



Records the Sun's Heat

from a star is concentrated upon a thread of platinum as fine as the web of a spider. Through this thread a current of electricity is kept flowing, and upon the temperature of this thread de-

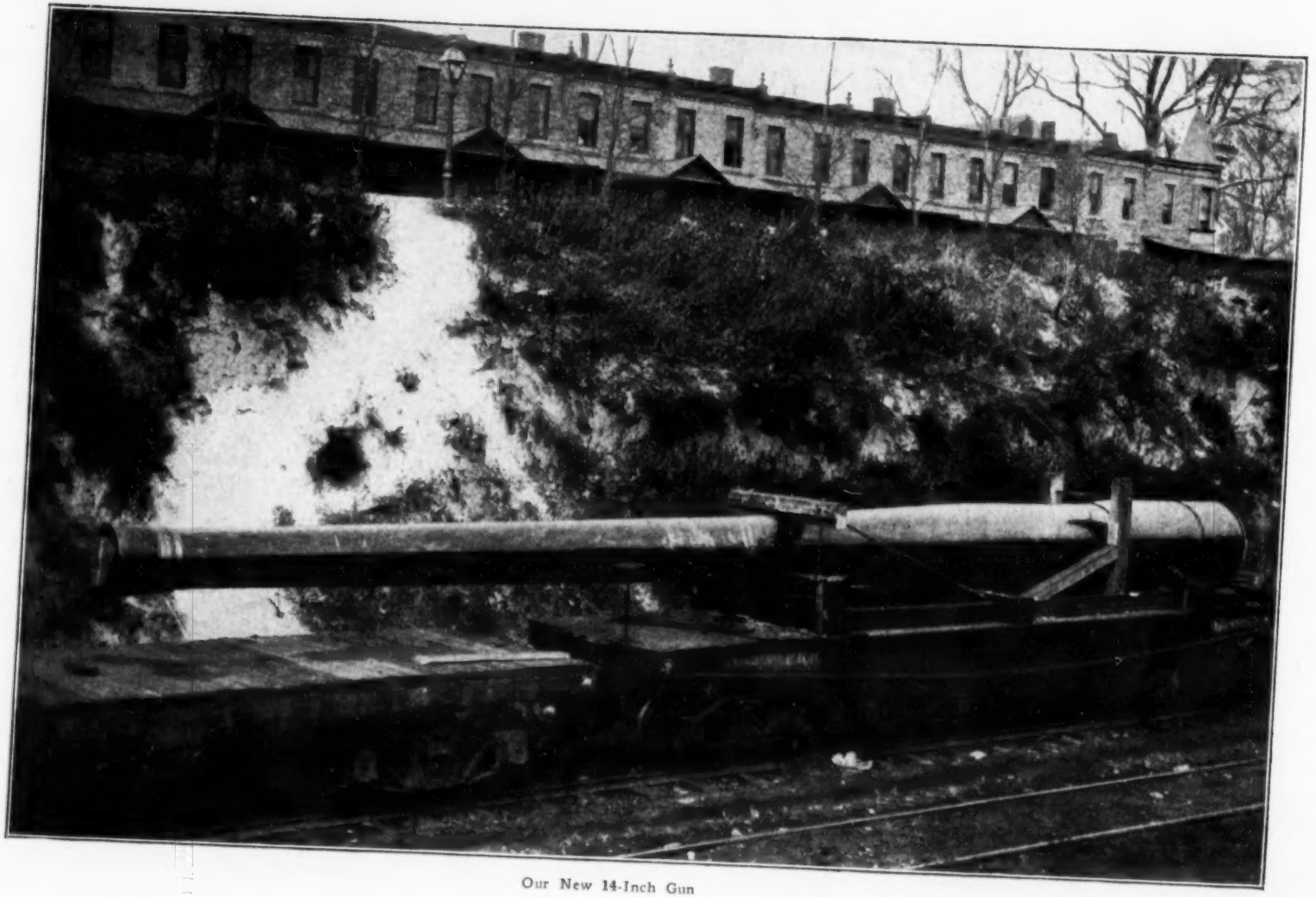


Measuring the Heat of a Star

pends the electrical resistance, which is measured by the most delicate galvanometer in the world. This galvanometer is a miniature concave mirror of the diameter of a pinhead, placed in the middle of a suspended piece of spun glass fastened upon a delicate bit carved from a dragon's wing. It is, in fact, a balance, the whole being suspended from a fiber of spun quartz crystal, 2 ft. in length and of a thickness of 1/1,000 of an inch.

Upon being struck by a ray of starlight, the temperature of the platinum thread is changed, the resistance to the electricity accordingly changes, and the balance moves. Thus is registered on the scale the exact amount of heat that the star radiates to the earth.

The Eastern Indiana hospital for the insane has been provided with a moving picture outfit, and receives new films twice a week for the amusement of its patients.



Our New 14-Inch Gun

EXPERTS APPROVE 14-INCH GUN

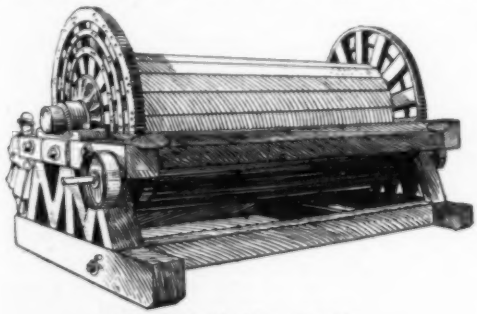
The big, 14-in. gun, over which the naval critics had quite a controversy regarding its practicability, has been approved by experts after a severe test at the proving station at Indian Head, on the Potomac, below Washington.

It is the largest and most powerful gun for naval use ever adopted by the United States, and the experts of the foreign navies are watching it closely.

The big gun has been described at length in Popular Mechanics. It weighs 63.3 tons and fires a projectile weighing 1,400 lb. The photograph reproduced on the opposite page is the only one taken of it, as the government jealously guards its innovations in weapons.

HUGE CABLE REEL

One of the largest cable reels in the world has just been finished by a concern in San Francisco and wound with 27,000 ft. of cable. The reel is 25 ft. long, 14 ft. high from base to top of wheel, and its weight is about 10½ tons, the axle alone weighing a little more than 4 tons. The 27,000 ft. of

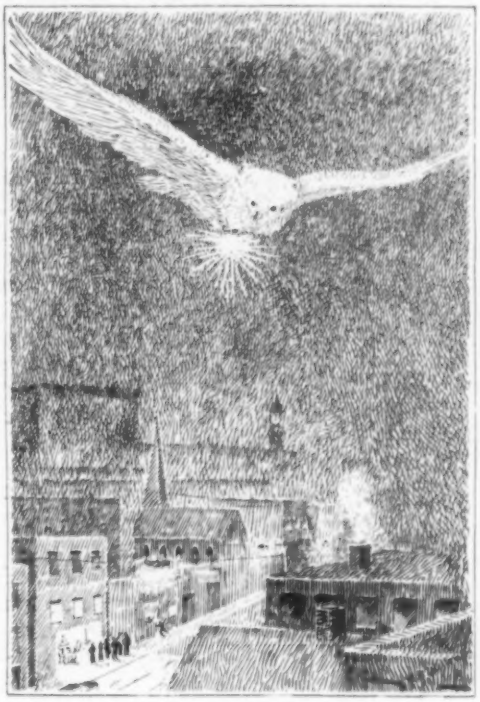


To Hold 134 Tons of Cable

cable to be wound upon it weighs approximately 134 tons, which will make the weight of the whole close to 145 tons.

MYSTERIOUS AEROPLANE A HOAX

Strange stories of a remarkable aeroplane which made a trip of 300 miles at



The Worcester Aeroplane

one flight just to try out the motor, ascended miles into the air without the slightest effort, and sailed around for nearly an hour with the motor stopped, but about which nothing tangible was forthcoming, held credulous thousands of newspaper readers in awe recently. Expert aviators, however, wanted to see the data before they would believe.

For three or four days the papers of the country scrambled for news of the mysterious aerial craft which was supposed to belong to a mechanical engineer of Worcester, Mass. Scores of persons claimed to have seen it darting through the air at night, being enabled to follow its course by the lights which it carried, they said. The Worcester man helped the hoax along by giving out interviews, intimating that he would soon reveal his wonderful secret to the world.

Then the truth came out.

Jokers had tied lanterns to owls and released them for several nights after the original yarn about the aeroplane was sprung.

ESCAPING FROM SUBMARINES

The escape of the crew of a disabled submarine is a problem yet to be satisfactorily solved, but experiments are being pushed forward in all the navies of the world and at the present time one method, at least, has been devised that offers a fair chance of escape.

The Helmet and Jacket

The necessity of rendering the crew of a submarine independent of poisonous gases, to preserve them from drowning in the vessel, and to provide means of escape by ascent to the surface, has so far been met by numerous air-lock schemes, detachable chambers or lifeboats, and self-contained diving helmets.

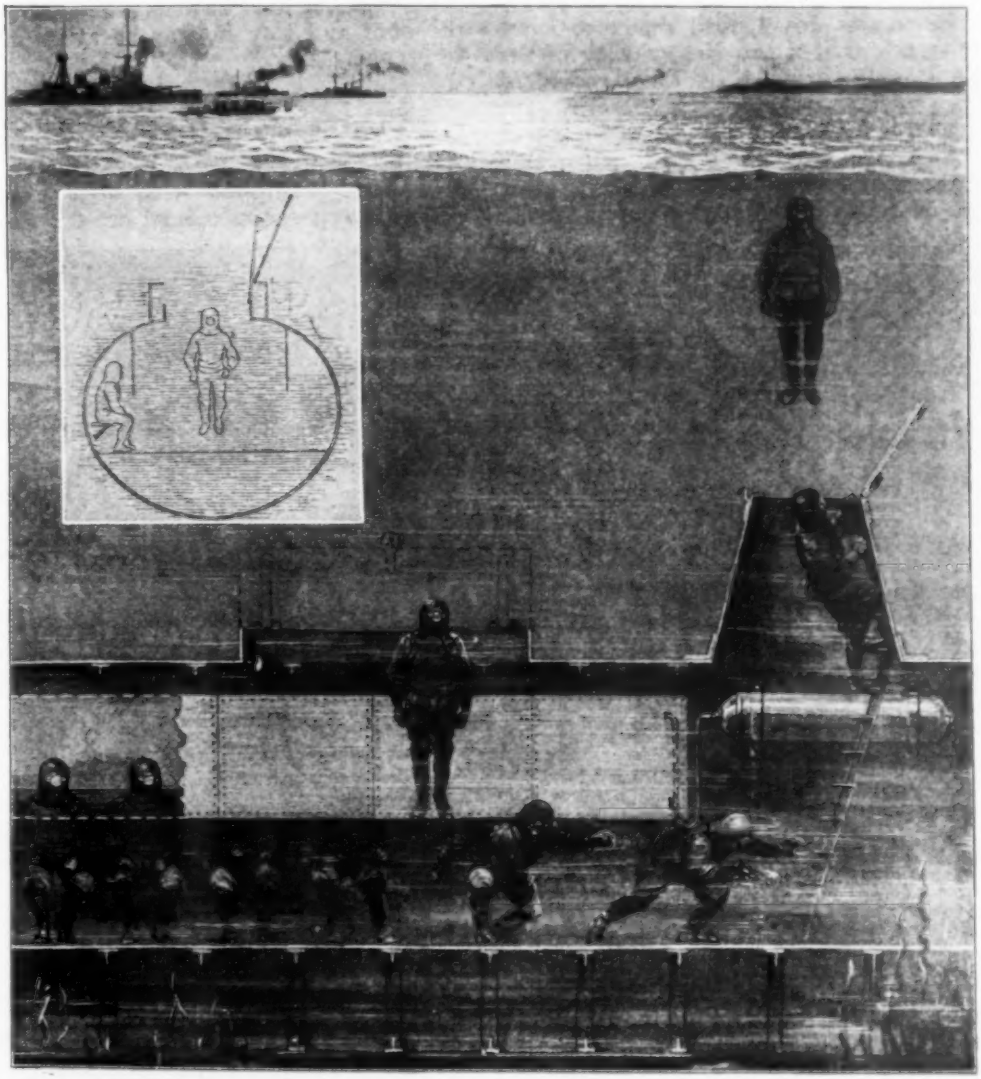
Air locks alone are considered of very little use except in shallow water, but are deemed essential in connection with all methods of escape. The air lock may be a portion of the submarine provided for the special purpose, but the general cavity of the vessel itself is considered best. If a hole is made in the submarine at any point below its top, the water will only enter until the air, which cannot escape, has been compressed to a pressure that is equal to that of the water outside. But, if the hole is made at the top, the water will gradually replace the whole of the air, unless, as is shown in the accompanying diagram, bulkheads are arranged to trap the air. These bulkheads are made of steel plating, and drop down three or four feet from the top of the hull on each side, as would the partition of a room if built down from the ceiling instead of up from the floor. When water enters the submarine from the top, the air is driven into the pockets thus formed, and, becoming sufficiently compressed, keeps the water out, so that the crew, standing up, find their heads above the water.

This kind of air chamber, therefore, combined with self-contained air-helmets and jackets, constitutes the surest method of escape from submarines yet evolved.

The helmets, as shown in the illustrations, are large enough to allow the head free movement, slope away to fit the shoulders, and are connected to a short jacket of strong waterproof material. In front of the jacket, inside, is a pocket containing a combined air purifier and oxygen generator, consisting of two small chambers formed in one case. The chambers are filled with a substance which, when in contact with the water vapor of the breath, gives off pure oxygen gas and forms a caustic alkali. The alkali takes up the carbonic acid gas of the respired breath and forms an alkaline carbonate. In this way the same air, purified and re-oxygenated, is used over and over again. The total outfit weighs 16 lb., and folded up occupies a space about one foot square. Such a helmet is provided for each member of the crew, and hangs on a hook in the air pockets formed by the bulkheads. They can be put on without assistance in 30 seconds.

When, in case of accident, a submarine so equipped fills with water, the crew take their positions behind the bulkheads and pull the jackets and helmets over their heads, drawing the jackets tightly around their waists by means of a belt. Then, one at a time, they duck out under the bulkheads into the water-filled portion of the ves-

sel, and make their way to the ladder leading to the conning tower, or, if necessary, to the torpedo hatch. The water in the vessel, of course, makes the pressure inside equal to that outside, and when the hatches are opened the jacket is sufficient to gently raise the wearer to the surface, but an additional device is also fitted to enable the wearer, when he reaches the surface, to inflate a flexible chamber, thus forming a life belt. This chamber is



Method of Escape from Submarine—Sketch Shows Air Pockets Formed by Bulkheads

the members of the crew find no trouble in gaining freedom from the submarine and rising to the surface. The different stages of the procedure are clearly shown in the large illustration.

The amount of air generated within in the body of the jacket, and is necessary because the length of time the air purifier will remain in action is limited to a period of about 30 minutes, after which period the door of the helmet must be opened in order to admit fresh air for breathing. It is obvious, how-

ever, that, if a man has any chance at all of escape, he will have reached the surface within that period after donning the helmet. The reason for not having the buoyancy chamber inflated before reaching the surface is because weights would be necessary to keep the wearer down until ready to leave the submarine, and the velocity of the rise to the surface on the removal of the weights would be dangerous.

All the submarines of the British navy are now equipped with this means of escape, which is far superior to detachable chambers or life boats.

A Trap for Tiger Catching

MALAY TIGER TRAP

A strong trap, not unlike the ordinary cage rat trap familiar in all parts of this country, but huge in scale and made of medium-sized tree trunks driven into the ground, is used in the Malay peninsula to catch foraging tigers.

As a rule, the tigers are left unmolested by the natives, but when one of the beasts acquires the habit of visiting a village, such a trap as the illustration shows is built. A live dog or goat is placed inside the trap as bait, and the tiger in its attack upon the sacrificed animal springs the crude mechanism that allows the door of the trap to drop behind him. When the time comes for the killing of the captured tiger, armed natives stand about the door and slay him as he attempts to escape.

ALL-STEEL RAILWAY CAR

Although many railroad systems are now being equipped with steel passenger coaches, the official car for executives of the Pennsylvania road, just turned out of the shops at Altoona, is said to be the first all-steel car. Not one piece of wood was used in it.

Its features as an official car are also interesting. It will have desks, typewriters, maps, and other office accessories required for carrying on business, the object being to enable those who use it to do their work while traveling from place to place. The car will also have telephones that can be connected up with the system's lines wherever it stops.

The Aerial Meet at Los Angeles

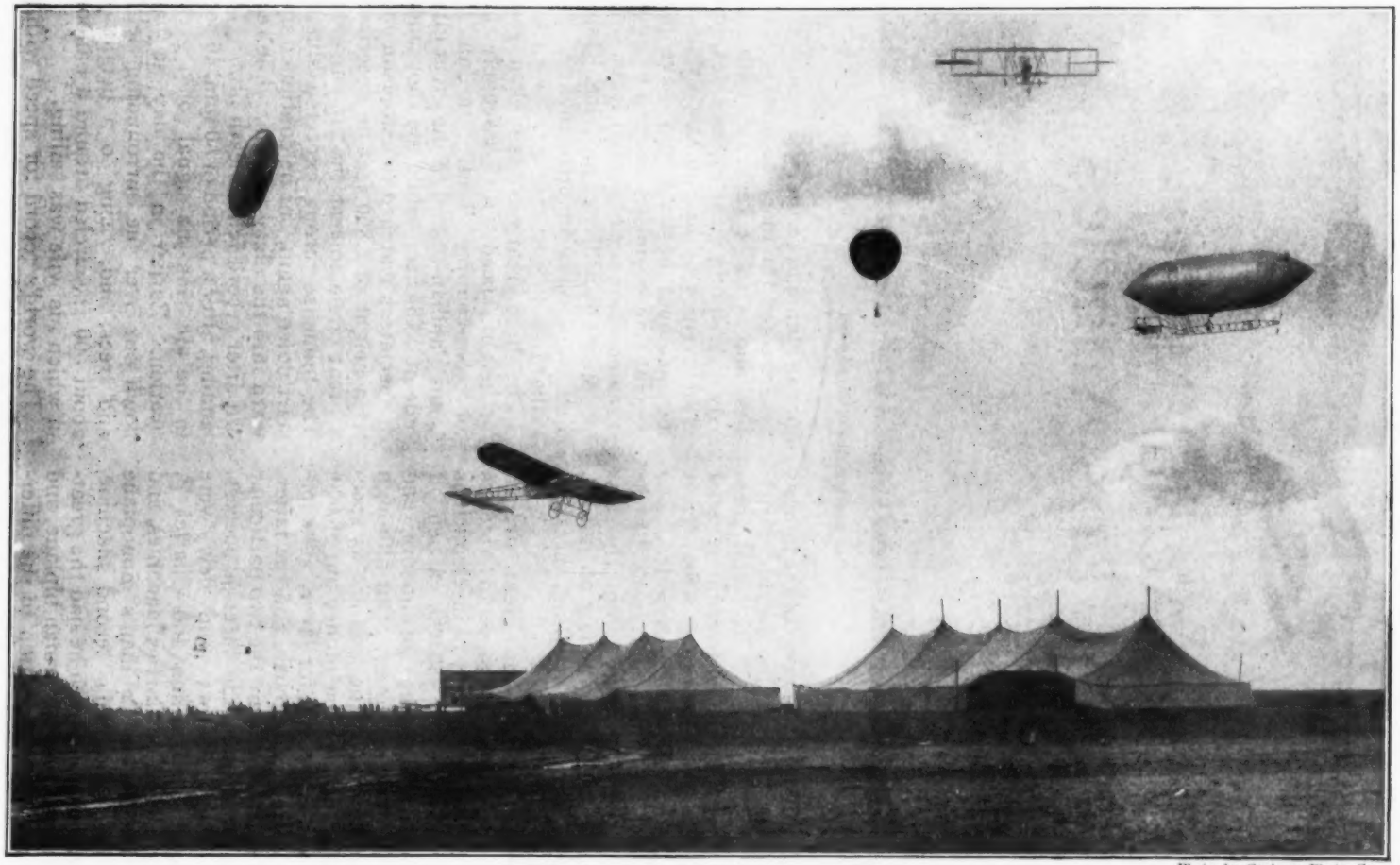
Paulhan Soaring Above Grandstand

ALTHOUGH only two of the famous flying men of the world participated, and the list of successful aeroplanes was limited to five, three aerial records were broken at the first great aviation meet held in America. Los Angeles, Cal., was the scene of the event, and every day, from the first flight on Jan. 10, to the last on Jan. 20, brought forth some startling, spectacular event.

Louis Paulhan, the great French aviator, induced to come to America with his little company of mechanicians by a guarantee of $50,000, carried off the greatest number of honors, and $18,000 in prize money. But although Glenn Curtiss' flying was not as spectacular, and his prize money but $6,000, he was a close rival for favor. The former, daring and boyish, and the latter, keen and silent, were the two particular stars who made the meet a success. The other aviators who flew were Charles K. Hamilton and Charles F. Willard, both on Curtiss machines, and M. Miscarol on Paulhan's monoplane machine. Paulhan's second machine, and the one on which he had the greatest success, was a Farman biplane, and this fact draws attention to the difference in standing of the two men. Curtiss invented the machine on which he flies, and is to be reckoned with not only as a daring rider in the skies, but as an inventor, while Paulhan, although the machines he uses may have important improvements devised by him, is famed alone for his aerial feats. His monoplane is a Blériot machine. Hamilton won $3,500 in prize money, and Willard $250.

The three great records broken were for height, speed with passenger, and for cross-country flight. On Jan. 12 Louis Paulhan soared to the great altitude of 4,165 feet, while the thousands of spectators watched in astonishment. At a height of 1,300 feet he described a great circle to test the air currents. The immense throng expected him to start down again, but he continued upward into the dizzy heights, while record after record fell beneath him. His landing, after a period of 50 min. 46 sec. in the air, was the signal for a great ovation. Earlier in the day he had flown out over the surrounding fields and trees, and, rising to a height of about 500 ft., circled around a balloon in which his wife was sailing.

The world's record for speed with a



SCENE AT THE LOS ANGELES MEET

Photo by Graham Photo Co.

Hamilton in Curtiss Machine | Beachey in Dirigible | Paulhan in Monoplane | Captive Balloon | Glenn Curtiss in Biplane | Roy Knabenshue in Dirigible

passenger was made by Curtiss on the previous day, Jan. 11. With a passenger he flew around the course at a speed of 55 miles an hour. The cross-country record was made by Paulhan on Jan. 18. The distance of the flight was 45 miles over trees and fields to Arcadia, at the base of the Sierra Madre mountains. His time was 1 hr. 2 min., and the feat won him the prize of $10,000.

Aside from the aeroplane events, which were the main features of the meet, the spectators were given the privilege of watching two heavier-than-air machines and several balloons in flight. Lincoln Beachey and Roy Knabenshue operated the dirigible balloons. Clifford Harmon reached an altitude of about 10,000 ft. in one of the non-dirigible balloons, and J. C. Mars made a distance of 31 miles before landing.

From the standpoint of attendance and enthusiasm, as well as for the excellence of the flights, the event was sufficiently gratifying to warrant many more of like nature. Although two of the days were rainy and disagreeable, the paid admissions to the field reached a total of 176,466. This figure may appear small when compared to the 200,000 people who paid admission on one day to the aviation field at Rheims, but it must be remembered that France is small in territory and has but one center, while the United States is long and broad and has many centers. Thousands of people could not expect to travel hundreds upon hundreds of miles from the east, south, and middle west for such an event.

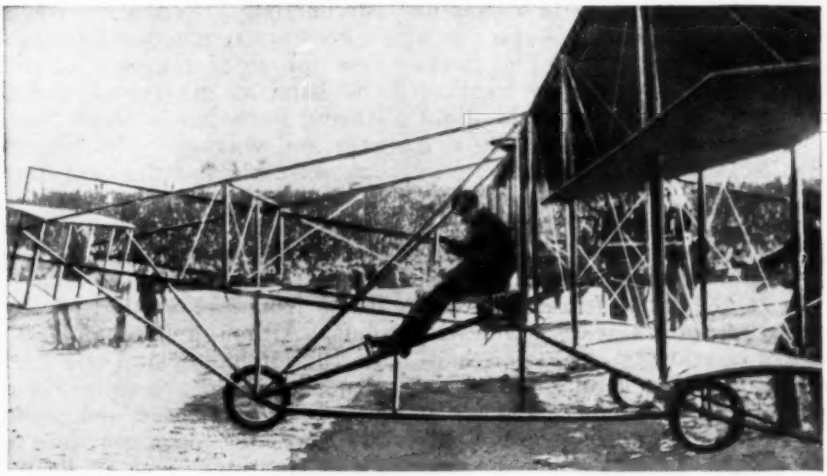
Promptly at one o'clock on Jan. 10, Curtiss opened the aviation meet with a machine never before used, and circled part way around the course while 20,000 people cheered. Then Beachey and Knabenshue appeared, and while they were moving slowly above the field, Paulhan made his appearance like a shot fired out of a gun. He appeared suddenly, without warning, and entertained the throng with a few of the feats for which he is famous. Regardless of any measured course, he flew back and forth over the field and the surrounding territory, frankly delighted at the plaudits he received. He flew for eight minutes, often waving one hand at the crowd, and once releasing both hands from the steering gear and waving. The honors of the day were his, but the next day Curtiss eclipsed him.

It was on this day, Jan. 11, that Curtiss carried a passenger at a speed of 55 miles an hour, and succeeded in rising from the ground in 6 2/5 seconds. Although Paulhan flew in both his Blériot monoplane and Farman biplane, he could not equal Curtiss, but his work was more spectacular. At one time four machines were flying at once, Hamilton and Willard having joined Curtiss and Paulhan in the air.

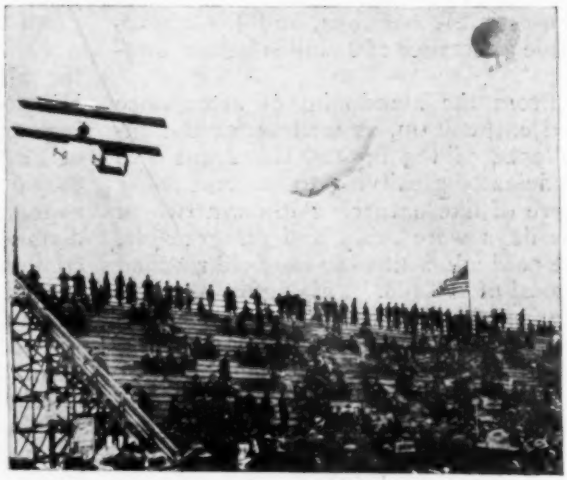
All other flights made on Jan. 12 were forgotten when Paulhan arose to the altitude of 4,146 ft. On Jan. 13, Willard won a prize of $250 for starting, and landing in a measured space of 20 ft. On Jan. 13, Curtiss won the $3,000 prize for the best speed in rounding the course 10 times. The distance was 16.11 miles, and he accomplished it in 23 min. 43 sec. The closest Paulhan could come to it was 24 min. 59 sec.

One of the most spectacular events occurred on Jan. 16, when Curtiss, Paulhan, and Hamilton, flew in a storm of wind and rain, describing circles in daring fashion, and passing above, below, and around each other. The race on the 17th between Paulhan and Hamilton was also exciting while it lasted. Hamilton made only 12 laps of the course, then had to descend because of a loose plane. Paulhan stayed in the air 1 hr. 58 min., covering a distance of 75.77 miles. The last really important flight was that by Paulhan on Jan. 19, winning him the $10,000 prize for his cross-country trip.

A few of the flights made between attempts to pull down prizes were of interest and importance for other reasons than speed, distance, or height. The chief participant in one of these was Lieut. Paul Beck, of the U. S. army. Flying as a passenger in one of



Louis Paulhan
Who Won Many
Prizes



View of the Grandstand at the Los Angeles Field

Upper Photograph Shows Glenn Curtiss in the Machine with Which He Made New Speed Record—He Is Adjusting Camera to Take Views as He Flies

the biplanes he attempted to drop imitation bombs onto a measured piece of ground from a height of 250 or 300 ft. None of the bombs struck the desired spot, but they landed close enough to prove that a ship could be struck in such manner, if the aeroplane were not first destroyed by gun fire.

On other days Paulhan used his machine extensively as a passenger craft, taking his wife for a 30-minute trip, and giving short rides to Mrs. Cortlandt F. Bishop, William R. Hearst, and several others. In one flight Glenn Curtiss carried a camera along with him and succeeded in taking several photographs of the wonderful panorama beneath. The camera was made fast to the framework of the aeroplane, and he operated it by pulling a string attached to the shutter. One of the illustrations shows Curtiss with the camera beside him.

Prizes and Winners

Cross-country flight for $10,000 prize—Won by Paulhan in 45-mile trip.

Height—Paulhan, 4,165 ft., $3,000; Hamilton, 625 ft., $2,000.

Endurance and time—Paulhan, 75.77 miles, time 1:58, $3,000; Curtiss, 37.05 miles, time 1:25, $2,000; Hamilton, 19.44 miles, time 39 min., $500.

Speed, 10 laps—Curtiss, 16.11 miles, time 23:43, $3,000; Paulhan, 16.11 miles, time 24:59, $2,000; Hamilton, 16.11 miles, time 30:34, $500.

SMALLEST AND LIGHTEST AEROPLANE

Santos-Dumont's aeroplane "Demoiselle," for some months considered the greatest wonder of all aeroplanes, because of its small size, is no longer the smallest in the world. The honor is now held by M. Raoul Vendome, whose little 180-lb. aeroplane has flown at a speed of nearly 60 miles an hour.

Smallest of All Aeroplanes

The tiny machine, which the inventor is lifting off the ground in the illustration, has a spread of only 16 ft., and a length of 16 ft. Its motive power is supplied by a 12-hp. motor. The operator's seat is between the wings, just back of the propeller.

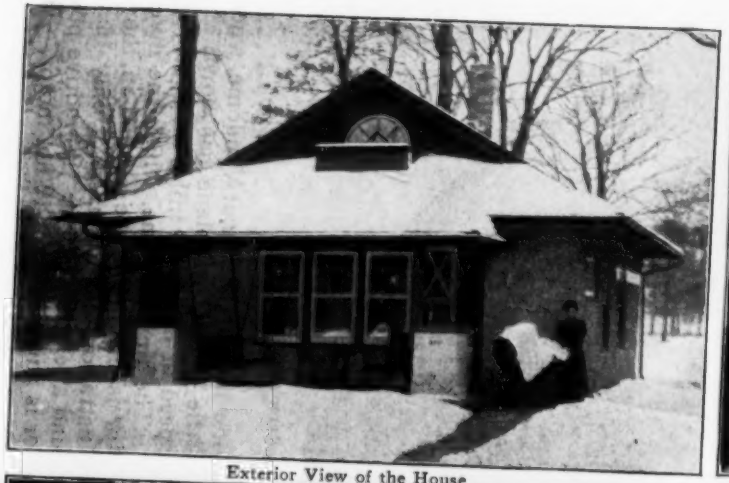
Three laps with passenger—Paulhan, 4.83 miles, time 8:16, $500. No other contestant.

Slowest lap—Hamilton, 1.61 miles, time 3:36, $500.

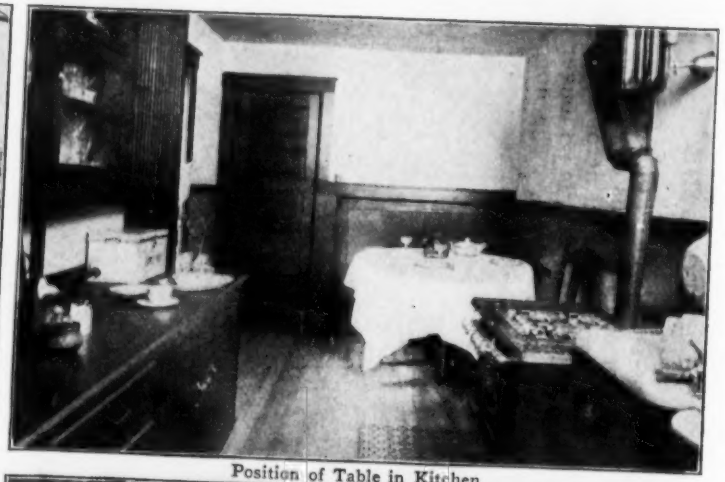
Quickest start—Curtiss, time 6 2/5 sec., $250.

Shortest start—Curtiss, $250.

Starting and landing in square—Willard, $250.



Exterior View of the House



Position of Table in Kitchen

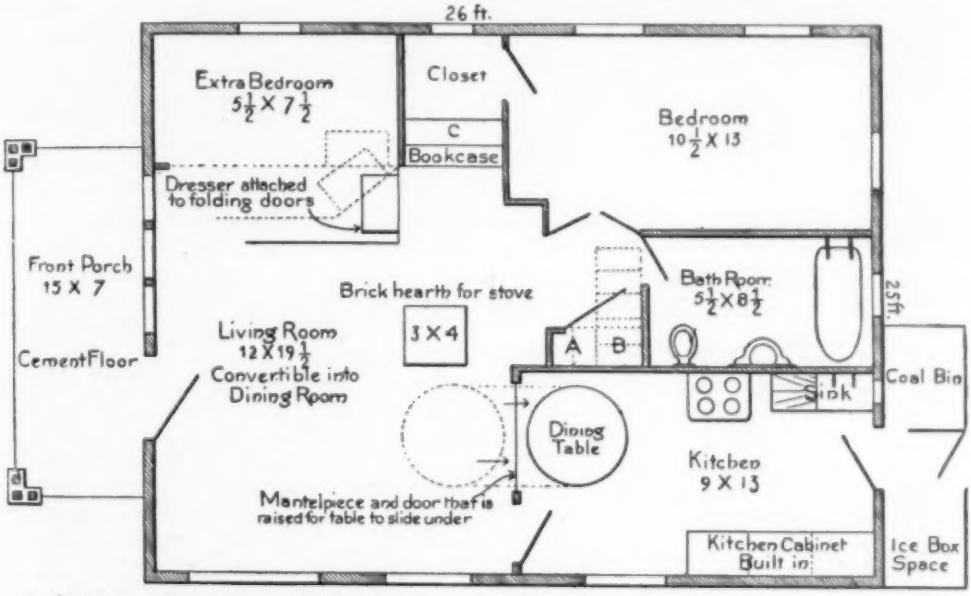
Sliding Wall Behind Mantel in Living Room

How the Table Comes Through

A HOUSE OF MANY WONDERS

Only 25 Feet by 26 Feet in Size, Yet by Ingenious Utilization of Every Inch of Space Is as Spacious and Comfortable as a Flat Twice as Large—It Solves the Servant Problem

THE skill of sailors in economy of space is proverbial, yet if on any ocean craft limited space has been put to better advantage than in a wonderful little home in Evanston, Ill., a suburb of Chicago, the story is yet to be told. And, while the ingenuity shown in the utilization of space is remarkable, the taste displayed in the arrangement and furnishing of the home would excite the admiration of the most fastidious.



A—Coat closet and trapdoor. B—Folding staircase and clothes hamper. C—Four linen drawers in closet

The Ground Floor Plan

Although the house is but 25 ft. by 26 ft. in size, it contains on one floor, a large living-room, which may be transformed in a twinkling into a dining room or a spare bedroom; a kitchen, bedroom, bath room, china cabinet, chest of drawers and many closets. A stairway to the loft room folds into a space 2½ ft. by 3 ft., and the stairs form drawers. The entire cost of the house is $1,600, including $500 for the site. Fuel bills are kept down, for only one stove is necessary, and the servant problem is solved, because none are required.

Adam Int'hout, the young Chicago chemist in whose mind the idea was conceived, is a native of Holland. He planned the house, unrestricted by his wife in everything but the proviso that he provide for adequate closet space, an important requirement of real homes that men often overlook. With this feature impressed upon his mind, he prepared his plans and called in the builders, and from the moment ground was broken until the house was completed, Mrs. Int'hout, who appears in some of the illustrations, did not see it.

Then the owner stepped aside and his wife took the generalship in making the furnishings harmonize with the type of house he had provided her with. Just how successful she was is told by the photographs, and the result is truly one abounding in the refinement of taste that makes a home artistic and restful.

"My reason for building such a house," says Mr. Int'hout, "was twofold, the factor of cost and the servant problem. I grew tired of finding my rent advancing $5 a month every time my lease ran out, and consequently set out to build a home of my own of a kind that would be artistic and comfortable, yet not prohibitive in cost for a young couple of moderate means. Also, and this is very important, we wished a home that my wife could take care of herself without too much work, as servants are continually in the way in a house of ordinary size. The result is that Mrs. Int'hout does not require more than an hour and a half of her time each day to keep the house in perfect order, and the meals for the two of us and the baby, who will have the loft room when he grows up, are simple to prepare."

A glance at the ground-floor plan reveals a living room, 19½ ft. long by 12 ft. wide; a bedroom, 13 ft. by 10½ ft.; a bathroom, 8½ ft. by 5½ ft.; a kitchen, 13 ft. by 9 ft.; a spare bedroom, 7½ ft by 5½ ft.; and a closet, 5 ft. by 3 ft., just outside the bathroom.

The closet is divided into halves, each 3 ft. by 2½ ft. One half is a coat closet, and the other half, extraordinary as it may seem, contains the staircase leading to the loft.

The other radical and interesting features of the house are the means by which the small spare bedroom becomes a larger one, the manner in which, in a few moments of time, the living room is converted into a dining room, and the folding staircase. There are, however, many other features, one of which is the arrangement of the bathroom fixtures and the kitchen sink so that the one set of pipes does for both. This constitutes one of the many ways by which the expense of building was kept down. One coal stove heats the whole house, and does it effectually even in zero weather.

The house is located on a corner lot, 53 ft. wide by 180 ft. long. When a visitor approaches, his first idea is that the house is hardly large enough to contain more than one good-sized room, and he continues to think so until he is ushered inside, then the idea is quickly shattered.

On entering, he sees a prettily decorated and furnished living room of a size that would do justice to a big house. The walls are covered with burlap, and considerable stained wood is showing. The beams across the ceiling interest him, but he does not realize that all this stained wood is ordinary pine, and that the beams are not just there for decorative purposes. The ceiling beams are the scantlings that form a foundation for the floor of the loft. Not only does this arrangement add to the decorative scheme of the room, but it provides several inches more of height than it would have if the ceiling were as low as the under sides of the scantlings.

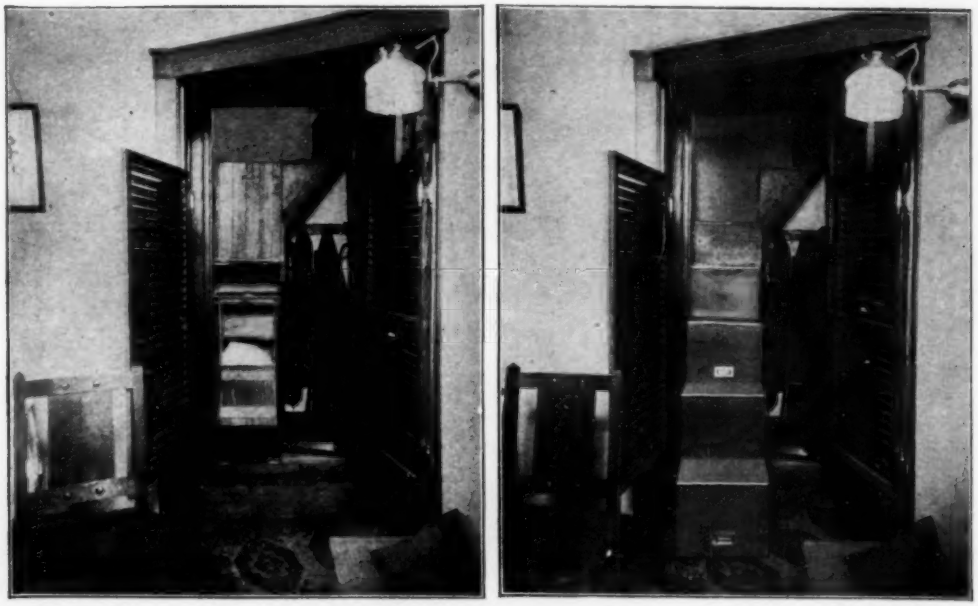
If the visitor stays to dinner, the first transformation within this room occurs. When the meal is ready Mrs. Int'hout bends down, as is shown in one of the illustrations, and touches the section of wall seen under the mantel. This slides silently and easily up behind the mantel, and she draws the dining-room table, completely set and with the meal upon it, into the living room. When the meal is over, the table as quickly disappears again into the kitchen.

Thus the living room divulges its first surprise, but, if the visitor is to stay for the night, it holds still another in store. One of the illustrations shows the other end of the living room, with its settee, the bookshelves in the wall, and the stove that heats the whole house. When the spare bedroom is required, the settee is swung around under the windows, and the wall that is seen behind it is pulled out a couple of feet into the living room. The wall is in two sections, as is clearly seen, and is pulled out about as far as the edge of the rug. Then a curtain is hung across the 2½-ft. opening and the room is ready. In the morning the wall is pushed back again, and the living room resumes its normal size.

Two illustrations show the staircase folded into its 2½-ft. by 3-ft. space, and

Photos by Burke and Atwell

The Living Room Looking Toward Swinging Wall—The Wall Extended with Bureau Attached, Transforming Part of Living Room into Spare Bedroom



Stairway Folded in Closet and Extended

extended for use. The photographs were taken from within the bedroom, and show the swinging lattice doors that give the room absolute privacy, but allow the heat from the stove in the living room to pass into it at all times. The closet into which the staircase folds has a door, but this is swung open to allow the taking of the photographs.

To return to the staircase proper, it must be noted that it is not only a staircase, but a receptacle for several things. The lower part, which is shown with the lid down, is a soiled-clothes hamper, and the upper part, the hostess explains, will be her hat box when the styles change sufficiently to allow her hats to be small enough to go into it. All that is required to convert this seeming pile of boxes into a practical set of stairs is to pull the two sections forward. The foot of the stairs does not enter the bedroom, as might be construed from the photograph, but rests across the passage leading to the bathroom, where it would not seriously obstruct, even though down continually, which it is not. The loft to which the staircase leads is a large room which provides 19 ft. by 8 ft. of standing space. It will probably be divided into two small sleeping rooms later.

Such are the main features of "the house of many wonders," and its occupants are perfectly content with their investment. Even the coal stove is included in the cost of $1,600. The land on which it stands cost $1,000, but only $500 of this can be considered as an item in the cost of the home, as one-half of the lot will contain a house facing on the other street as a future investment.

THE HEALTH OF AMERICAN MINERS

Although accident statistics show that more miners are killed or injured by accidents in American mines than in the mines of other countries, health statistics prove that the American miners, whether natives or foreign born, are healthier than mine workers in other lands. As a rule, the men working underground in America are seldom compelled to absent themselves on account of illness. Their continuous exercise in fairly good atmosphere seems to make them physically fit.

EDITORIAL

Fifteen years ago gasoline sold in barrel lots at two cents per gallon, while kerosene brought twelve cents. Today, owing to the gas engine, gasoline brings about fifteen cents, while kerosene can be had at six or seven cents per gallon. Inasmuch as three per cent is a fair production of gasoline and sixty per cent of kerosene from a gallon of crude oil, it is obvious that the next important advance in the internal combustion engine will be such changes as shall make the use of kerosene as generally practical and desirable as gasoline. Indeed, with the steadily large increase in the consumption of gasoline, the time is rapidly approaching when its price will be a burden, as, in fact, it is already beginning to be in England and Europe.

A given quantity of kerosene actually contains about seventeen per cent more heat units than gasoline, and is subject to much less variation in quality. It is also comparatively safe, though unpleasant to handle, and causes grease spots, yet does not waste from evaporation.

The inevitable conclusion must be such changes in the gas engine as now used for many purposes as will utilize kerosene, of which millions of barrels are already held in storage for want of a market. Some progress has already been made in this direction, but there is still much development to be made, and the field offers large rewards to successful inventors.

* * *

A bill was introduced in the recent session of the Wisconsin Legislature which deserves more than passing notice. That the measure never got beyond the committee to which it was referred should not discourage its friends from continued efforts to secure its passage, while other State Legislatures should frame and pass a similar law.

The bill provided severe penalties for any person, firm or corporation in the State of Wisconsin that, in soliciting advertising in the state, should misrepresent the circulation of the publication for which the advertising is sought.

The standard of business ethics in advertising has been raised and improved during the past ten years to an extent almost revolutionary. The great temptation always was, and still is, for the enthusiastic solicitor or unscrupulous publisher to unduly magnify the circulation of his publication. Thus, 10,000 actual grows to 25,000 claimed, and 25,000 is made to represent 50,000, and so on up. To sell a man a circulation of 40,000 when the publication can deliver only 30,000 is as fraudulent as to sell four pounds of nails and deliver only three. It is downright dishonesty in both instances. The need of the proposed law is because in the case of the nails the buyer can protect himself by weighing his purchase, while in buying circulation he has to depend on the statement of the seller. The honest, legitimate publisher would be greatly benefited by the proposed law, and will gladly lend his influence to its passage.

* * *

The larger cities have studied the problem of pure drinking water, and applied scientific remedies where needed, until the quality has been brought up to a high standard in most cases. In the smaller towns, where less experienced men are in charge and the organization is not so complete, epidemics of typhoid are experienced which are only corrected after large numbers of residents have paid the penalty in sickness and death. Eternal vigilance is required on the part of city officials from the mayor down. Conditions which have been all right for months and even years are liable to change at any moment, and it is this state of complacency born of long immunity which is most to be feared. A daily or weekly analysis of the city water is so insignificant a price to pay for the protection it affords as not even to admit of any argument.

Probably the greatest risk the city dweller runs in his annual outing in the country is from contaminated water at summer resorts. The lack of the most ordinary precautions at many such places is both astounding and criminal. Drainage from main buildings, as well as outhouses and barns, is allowed to find its way, often by open and most direct routes, to the source of supply from which drinking water is obtained. The frequent result is that, instead of finding increased health and vigor, the children and often adults return home with the seeds of disease. Not until the guests at such resorts insist on a correction of these unnecessary evils by refusing their patronage, will proprietors generally awake to the point of applying a remedy.

Farmers, even the more scientific, are apt to ignore the question of water for domestic use, and nothing but their active, outdoor existence saves them from the illness which would certainly attack others. With the steadily decreasing amount of water in springs, streams and lakes; with the corresponding reduction in its purification, greater care and watchfulness will be needed on the part of all those who are responsible for the proper condition of the water the people drink.

The annual celebration of our National birthday is rapidly approaching, and for scores of happy, healthy boys and girls who are now studying their lessons and romping with their playmates, the days of life are nearly ended. About one hundred days in this world is all that remains to them. It is almost a certainty that some of the parents who read these lines, and think of the fatality as coming to other children than their own, will be among those to whom July 4th will hereafter bring only the saddest of memories.

Our indifference to the matter arises from the inborn human tendency to always think of disaster in the third person instead of the first, and thus no one is specialized. Suppose, for example, that Congress voted to sacrifice one boy each year as a National Fourth of July offering —just one single boy. What an uproar we would all make! Suppose, in due process of law, the victim was selected and his name and residence announced some morning. Suppose, also, he was as unpromising and unlovable a youngster as could be found and he lived in a cross-roads village so small it was unknown beyond the county line. In a few hours the daily press would flood the country with extra editions, while editorial writers would hurl denunciation at the law-makers while demanding a special session of Congress, if necessary, to repeal so infamous a thing. Matters of the greatest business importance, social events of the first order and other doings of equal magnitude would have to appear in obscure portions of the papers. In every city, town and hamlet petitions to the President would form as if by magic; people of every occupation would neglect their business in order to affix their signature, and before night several million names of angry and determined men and women would have signed the demand. To carry the argument to its extreme, we may even assume that Congress refused to repeal, the President declined to intercede and the highest court did not interfere. An attempt to execute the decree would precipitate civil war.

All this to save one unknown boy.

And yet on July 4th, 1910, two hundred or more boys and girls will yield their lives to a form of celebration which has long ago ceased to be even patriotic.

While the basis is an impossible one, the pictured results would be true in every detail. An entire nation in arms to save one unwilling victim. The two hundred perish with only a passing notice by the public and sorrow confined to relatives and near friends. Then why should this annual sacrifice continue? Are not the two hundred of equal consequence as one? As long as we continue to be satisfied with brief annual regrets, and confine our efforts to mere talk, conditions will not change. Two things would seem to suggest as the logical course to bring about a remedy.

Something equally attractive to children must first be provided as a substitute; and

Second, the young people themselves must work to accomplish the change. This would probably be done by a National movement operating through the public schools.

To separate young America from toy pistols and dynamite crackers is no insignificant undertaking, but nothing to what the Spartan youths did voluntarily.

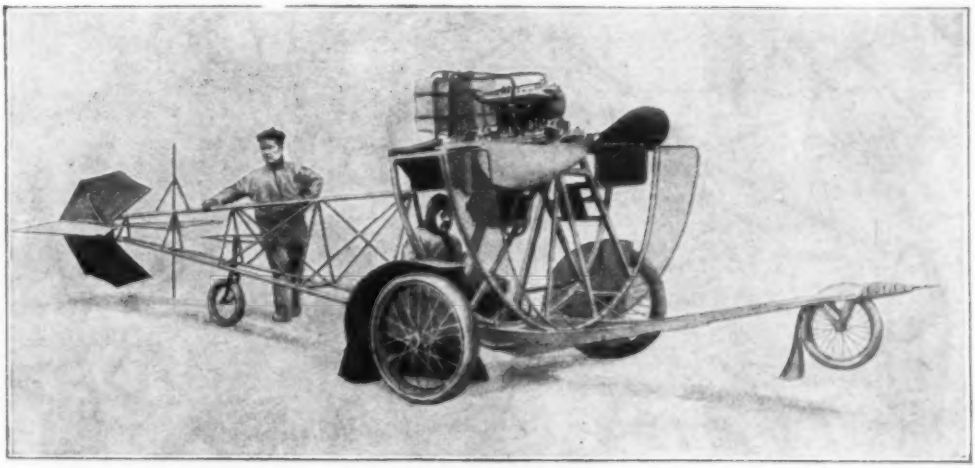
* * *

A well-known English engineer declares the steam turbine to be but a step in the evolution from the reciprocating steam engine to the eventual power which will be a gas turbine, and that the steam turbine, while a decided advance in itself, is not destined to have a prolonged existence.

From the old-style, unreliable gas engine of fifteen years ago, developing only a few horsepower, to the big 2,000-hp. units now operating in large steel works, marks a distinct era. As yet the feature of size is against the large unit gas engine which occupies double the space of a steam engine of equal power. The perfect gas turbine may not be realized for some years, but it is destined to come, and the man in whose brain it is conceived will take place among the greatest in the history of mechanical invention and discovery.

Cities contemplating the installation of a high pressure system for fighting fires will do well to consider the matter well before incurring the expense. The high pressure system is not proving the unqualified success which was predicted for it. On more than one occasion the pressure was not forthcoming when needed; and when it does respond, the enormous power of the stream tears things to pieces or ruins more property than it saves by reason of the great deluge of water. Several chiefs have declared its province to be chiefly in fighting a great conflagration such as would warrant the use of explosives to check the advance of the fire. This may be a somewhat exaggerated view of the situation, while on the other hand it is no secret that many insurance men who were exceedingly active in securing a high pressure system now regret it. From this it would appear that as an auxiliary, operated perhaps under much less pressure than was originally planned, it may have its uses, but that the present steam fire engine which can be taken wherever needed, and which will pump water wherever found, is not likely to be superseded by high pressure lines as at present installed or planned.

H. H. WINDSOR.



Aviator's School-Ship

NON-FLYING AEROPLANE FOR AVIATION STUDENTS

A machine, constructed somewhat along the lines of Santos-Dumont's "Demoiselle," one of the smallest and cheapest aeroplanes yet invented, but which runs along the ground instead of soaring into the air, has been constructed by a French instructor of aviation so that his pupils may run no risks in the preliminary stage of their education in aerial flight.

By the use of this apparatus he is able to teach novices in aviation how to operate the mechanism and allow them to familiarize themselves with its every part before any attempt to make flights. It will also serve to give them confidence and thus run no chance of their becoming excited when they find themselves leaving the ground and soaring for the first time.

The fan propels the machine over the ground although not at a rate of speed approaching that of the aeroplane after which it is modeled. It has no planes and therefore will not leave the ground. It is fitted with light, wire-spoked automobile wheels, and, what is an anomaly on anything pertaining to aerial flight, mud guards.

During a fire which cut off the escape of persons at the end of the great pier at Yarmouth, Eng., the life-saving crews in the vicinity were kept busy rescuing them in boats.

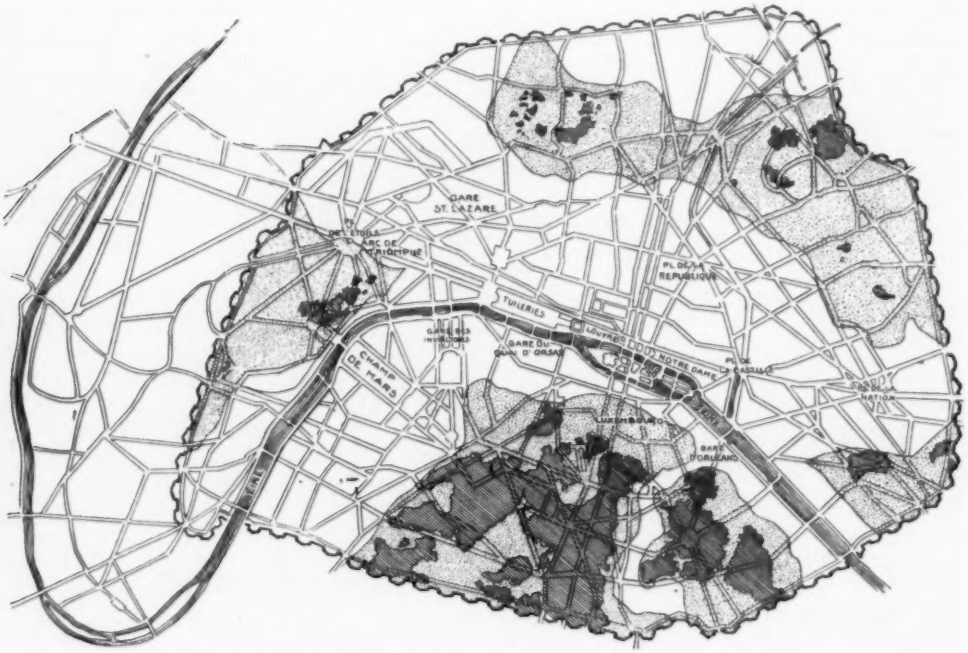
PARIS BUILT OVER YAWNING CHASMS

Severity of Recent Flood Partly Due to Abandoned Quarries, Extending for Many Miles Under Great Buildings and Beautiful Streets

THE quarries of Paris, many of which have existed under the city for centuries, little known even by Parisians themselves, proved an agency which caused damage to the extent of millions of dollars when the River Seine flooded the city during the latter part of January.

Paris waited, fearing every minute to hear great crashes which would tell them that ancient landmarks had collapsed.

The Seine is about 500 ft. wide as it flows through the city. At one point it broadens and surrounds two islands, which are connected with each other



Map of Paris Within Confines of Old Wall Showing Sections of City Undermined by Excavations Darker Shading Indicates Where Gypsum Was Mined. Light Shading Shows Where Stone Quarries Have Been Operated

Into these yawning chasms, which it is estimated, underlie one-tenth of the French capital, flowed countless tons of water, rushing in angry torrents through the eight hundred miles of galleries, and tearing away walls which supported public buildings and private homes. During the height of the flood, when Paris was experiencing a reign of terror, great holes appeared in the streets, sidewalks dropped out of sight, and in the darkness caused by the destruction of the lighting systems, and with the city on both sides by numerous bridges. They were swamped early in the flood. The most congested portions of Paris are on the banks of the river, and are the sections which suffer most.

Famous boulevards were transformed into roaring torrents early in the flood, and many of the best known restaurants, public buildings and landmarks were deserted when water crept into them and covered the lower floors with 3 and 4 ft. of mud and sewage.

The Luxembourg Palace, the great Observatory, the Pantheon, the Theatre de l'Odeon, as well as thousands of churches and homes, were built over these tremendous gulfs of long since abandoned stone pits and quarries, spoken of as the catacombs.

Paris occupies a broad, deep basin, about five miles in width from north to south. The Seine flows through the city for eight miles, great stone quays bordering each side of the stream. The French metropolis, with all its splendid monuments, came up almost entirely on its own site. The rock for many of its most massive buildings was quarried under the city. Gypsum was dug out in great quantities, and good stone was plentiful. And Paris went gaily along, undermining itself to build the city. The flood brought the day of reckoning.

In some places these great excavations, from which millions of tons of stone have been taken in the past, are two stories deep. Through a great part of these gloomy vaults run mazes of

Steps Descending into Quarries

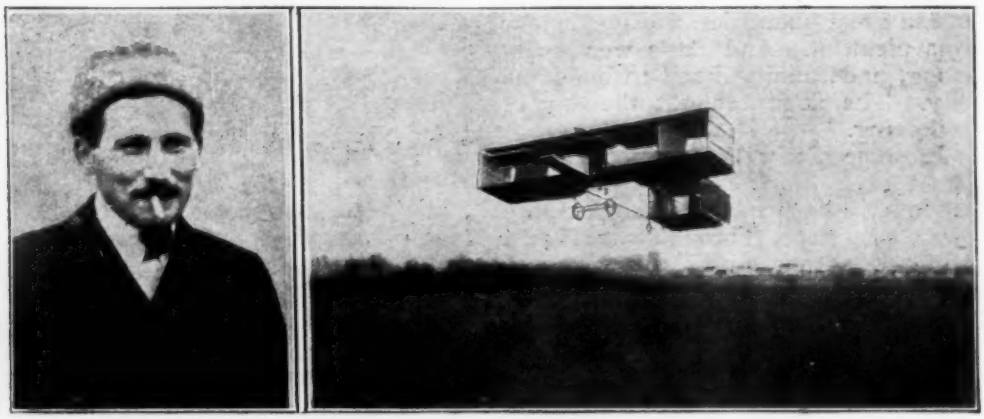
Quarry Forming Domed Chamber

water pipes, wires, conduits, pneumatic tubes, subways and sewers. These were all rendered useless a few days after the flood started. Only a few months ago one of the streets in the Montmartre quarter fell into one of these chasms and several persons were killed. Of late years the municipal engineers have been attempting to locate the dangerous places and take measures to prevent such accidents. Although an exhaustive survey of underground Paris has been made, it is admitted there are many great excavations yet undiscovered. The most remarkable of all the underground galleries were found no longer ago than 1903 while workmen

were excavating at the angle of the Rues Faubourg, Saint-Jacques, and Cassina. These galleries date back to the seventeenth and eighteenth centuries.

In addition to the 800 miles of subterranean galleries and sewers under Paris, there are two small rivers which flow under the city.

By means of locks and dams the Seine was, until the recent flood, kept at all stages of water at about the same height, the minimum depth being about 10½ ft., so that boats of 800 tons burden could come up the river from Havre.



Delagrange and Machine Which Caused His Death

AVIATOR DELAGRANGE KILLED BY COLLAPSE OF MONOPLANE

The breaking of the right wing of his monoplane during a high wind was responsible for the death of Leon Delagrange, one of the foremost of the French aviators, at Bordeaux, France, on Jan. 4. Less than a week before his death he had made a wonderful new record by flying 124 miles in 2 hours and 32 minutes. He was attempting to beat this record when he was killed.

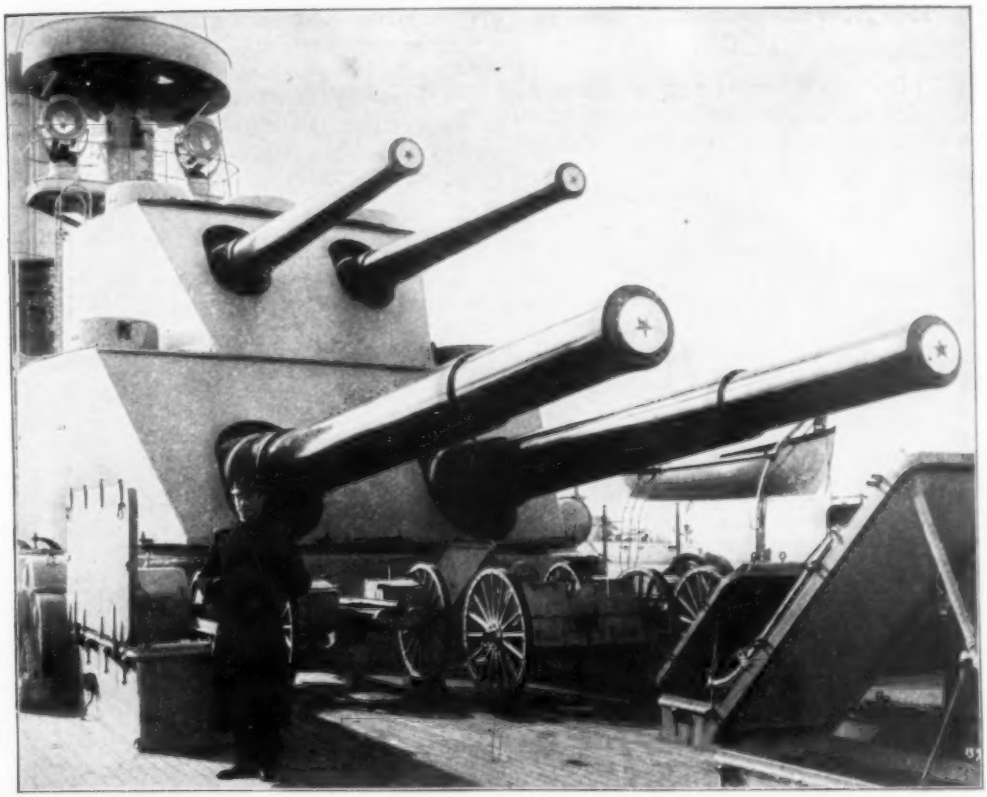
Delagrange had increased his motor-power from 18 to 40 hp., without strengthening the framework to bear the extra strain. While he was flying at great speed the aeroplane's wings suddenly rose and doubled up, like an umbrella blown inside out. The machine darted earthward and struck the ground violently, the aviator being crushed beneath the wreckage.

Delagrange was the fourth flying-machine driver to be killed within four months in France. The others were Lefebre, Capt. Ferber, and the Spanish tailor, Fernandez.

REAR LIGHTS ON MOTOR-CYCLES

Although the laws of England do not compel the carrying of a rear light on motorcycles, a widespread agitation is being made by automobilists to impress the advisability of such protection. Many motorcyclists have been run down in the dark, and narrow escapes have been numerous. The driver of a speeding car, even though it is equipped with powerful acetylene headlamps, often finds it difficult to see a motorcycle ahead of him, speeding in the same direction, until it is almost too late to avoid accident.

The explosion of a gas oven in a plant at Jamestown, N. Y., blew a window casing from the fourth story of the building into the river. Sometime later the casing was recovered and a watch that had been hanging on a nail in it was still attached and keeping good time.



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LIFE IN OUR NAVY—No. 8, On the "Georgia's" Quarterdeck

PHOTOGRAPHING IMPERIAL COFFIN BRINGS DISASTER

Several Chinamen were arrested while attempting to photograph the coffin bearing the remains of the late Empress Dowager of China on the day of the funeral, and as a result it became known that Viceroy Twan Fang had ordered them to make the photographs. Consequently, this high Chinese official was charged with lèse-majesté and held for trial. Such an act would mean the immediate dismissal from office of a less high official, and serious if not fatal punishment for a Chinaman of lower station in life.

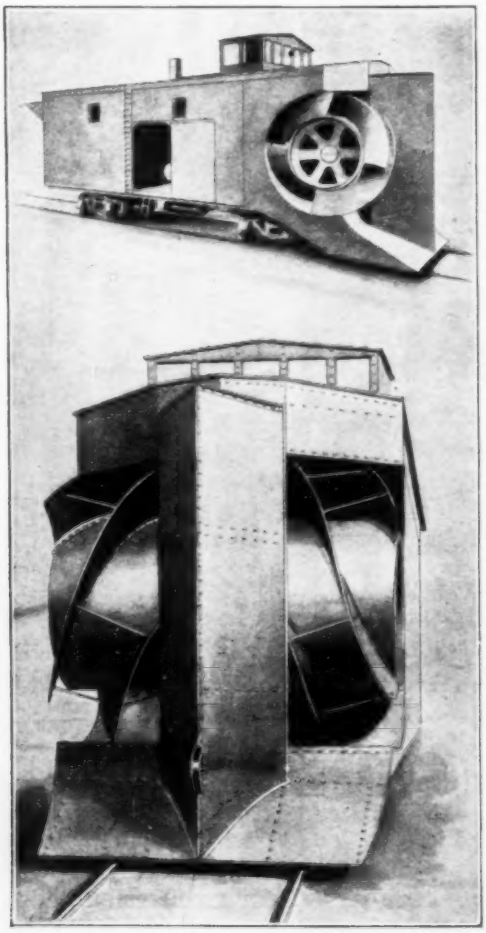
Massachusetts has ordered 24,000 number plates for the tagging of automobiles this year.

OPEN YET EFFECTIVE SHELTER HOUSE

The new shelter houses erected for waiting passengers by the Terre Haute, Indianapolis & Eastern electric line are unique, because, although open, they provide absolute shelter from wind, snow or rain. They are built in the form of a Greek cross, forming four separate compartments, with a bench along the two walls of each compartment. No matter from what direction the storm is coming, one or two of the compartments always provides a perfect shelter.

IMPROVED ROTARY SNOW PLOW

This form of rotary snow plow was developed after many experiments with large models, and the result is a



Side View of Expeller—Front View of Plow

plow capable of excavating its way through almost any depth or condition of snow.

The forward end, or snow-fighting part of the plow, is of steel and contains three chambers. The middle chamber is open to the interior of the car, and its front carries the nose of the plow, which projects forward to the end of the apron or shovel. This divides the snow and directs it against the expellers, which are contained by the two side chambers. Each expeller consists of four spiral flanges. Riveted to the flanges are 4½-in. steel plates or blades, 22 in. wide, forming a true helix upon the hub. The expellers are revolved at a rapid speed by steam engines, connected to them by silent chain drive. When the plow is forced into a drift or cut, the snow is caught by the expellers and thrown upwards and outwards with great force.

The plow was first tried on the Canadian Pacific system with great success. Owing to the solid condition of the snow attacked, it could not penetrate the mass at a speed of less than 6 miles an hour, but the expellers threw out the snow as rapidly as it was received. At a speed of 8 miles an hour the plow penetrated 45 to 50 ft. at a time, then withdrew to take another run at the mass. After getting through the heavy drift, a stretch varying in depth to 5 ft. was cleaned up at a steady run. Snow banks that had accumulated two months had become so compact that 50-lb. blocks thrown out by the expeller could not be broken by an ordinary shovel.

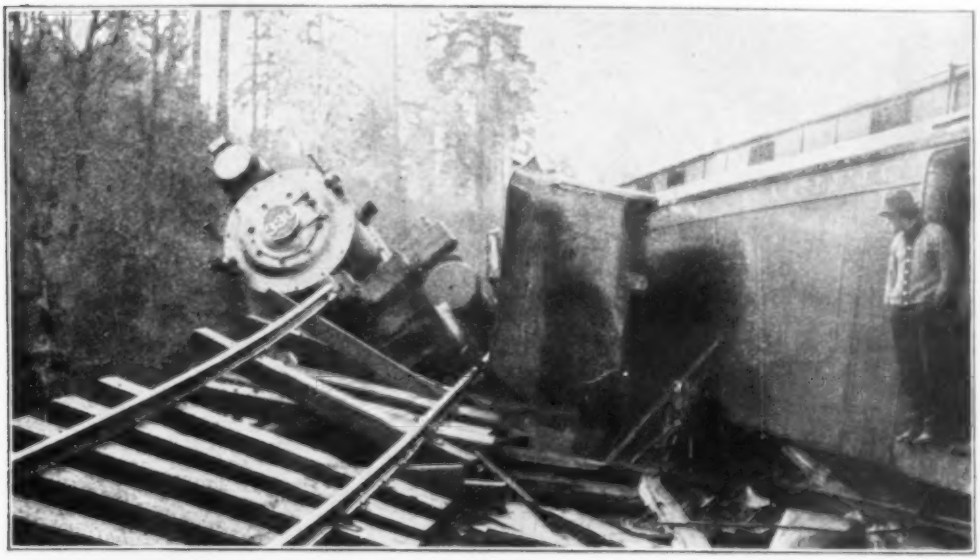
DEFENSE OF JAPAN STRENGTHENED BY RAILROAD

The opening of the Japanese railroad that cuts through the steep hills of the Yatake range and connects the provinces of Higo and Satsuma completes a continuous system between the north mainland and the southernmost part of Kysuhu. The length of the system is about 1,750 miles. Japan can now assemble three divisions of her armed forces at her southernmost point within 12 hours, and treble that number with forces from Tokyo within 48 hours. Aside from this strengthening of national defense, the last link of the road will make a great advance in transportation, thus adding to trade.

Princess Anna of Lowenstein-Wertheim, Germany, has invented a system of berths that will remain horizontal regardless of the roll of a ship in a sea.

WRECK CAUSED BY WASHOUT

Heavy rains during the months of November and December in Washington caused the wreck shown in these illustrations. The tracks of the Northern Pacific system near Olympia, the capital of the state, were washed out one night and the first through train met with grief. Both engineer and fireman were killed.

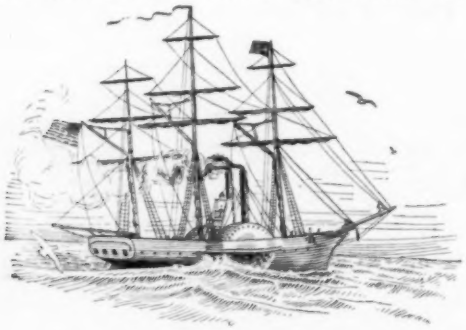


Showing Badly Torn Condition of Track—The Wreck from the Rear

The census bureau announces that throughout many parts of the country the number of applications for positions as census enumerators falls short of the demand.

THE FIRST OCEAN STEAMSHIP

The first regular steamship line in the world ran between New York and



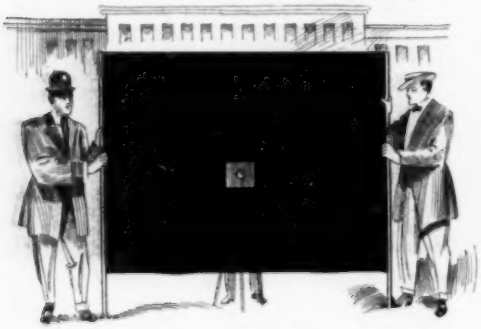
The "Fulton" in 1820

New Orleans, and its one vessel was the "Robert Fulton" shown in the accompanying illustration, which made its first trip on the route in 1820. The distance between the two cities by direct sea route is practically 2,000 miles, and the Fulton took from 15 to 20 days to make the trip one way. During the years in which the Fulton was on this route more than six round trips a year was exceptional.

The trip is now made in a little less than five days.

PHOTOGRAPHING WINDOW DISPLAYS

The elimination of reflections is absolutely necessary if a photograph of

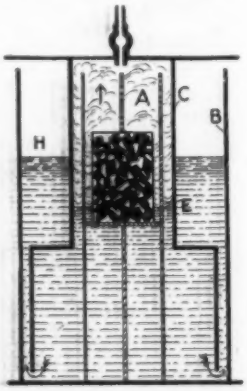


Screen for Window Photography

a display window is to be successfully taken in the day time, and the accompanying illustration shows a simple and inexpensive device for such elimination. It consists of a screen of ordinary black calico or lining cambric a little longer than the window is wide. This is fastened to two poles a little longer than the window is high, and in the center of the screen a hole is cut for the camera. When held a short distance back from the window the screen effectively shuts off all reflections from across the street or from whatever direction they come.

CAKE-CARBIDE ACETYLENE GENERATOR

A new acetylene generator system, using carbide treated in a special way and then pressed into cakes of circular blocks, has been introduced by an English automobile accessory concern. In the description of a new oxygen helmet, published in the January issue of this magazine, attention was drawn to the fact that its inventor had derived his idea from watching the working of the acetylene lamps of an automobile. Also, that the sodium peroxide used to generate the oxygen might be compressed into cakes and be sealed by tinfoil to retain its strength.



It is just such an idea that has been successfully carried out with the carbide in this new acetylene generator. The cakes are very convenient to handle, do not readily deteriorate if left in contact with the air—exposure for a week having but little effect upon it—and generates 5 cu. ft. of gas per hour as compared with the 3 cu. ft. from the ordinary granulated carbide.

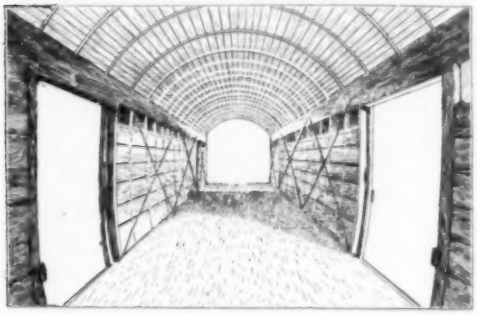
The generator in which the cake carbide is used is of a special, but simple type. The outer containing vessel, as the illustration shows, holds water, and

inside is another vessel which contains a frame on which the carbide is placed. The water comes in contact with the carbide from below, and generation of gas at once begins, continuing at a steady pressure. The spent carbide falls through the holder into the tank, where it can be cleaned out with ease. The remaining carbide is left in a perfect condition for further generation of gas, thus accomplishing great economy.

The arrangement of the carbide holder is such that the raising of it clear of the water, almost immediately stops the generation of gas.

CAR FOR TRANSPORTATION OF AEROPLANES

The Northwestern railroad, of England, is one of the first in the world to build a special type of freight car for the transportation of aeroplanes. The car is 50 ft. long, has two doors on each side, and at the ends are double doors which open the full height and width of the car. During the recent aviation

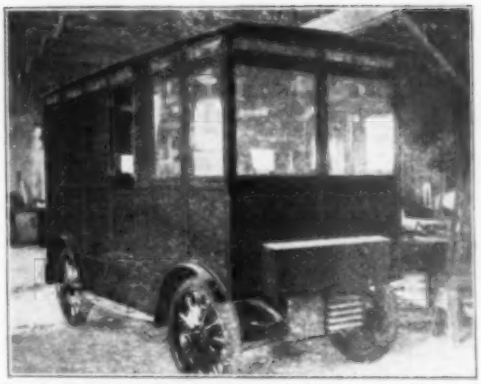


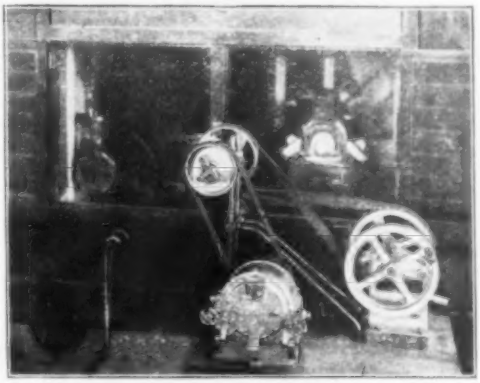
Special Car for Aeroplanes

meets in England the car was in such demand that other railways are building cars of like nature.

A MINER'S PROSPECTING AUTOMOBILE

Numbers of automobiles have been turned out for special purposes, but probably none is more unique in its embodiment or mission than the example shown in these illustrations. It is the property of H. W. Larsens, a Los Angeles mine prospector, and with it





Exterior View of Prospecting Auto—The Mining Machinery It Carries

he expects to make a prospecting trip into the Death Valley country.

He calls it the "Desert Rat," the name given to miners prospecting in such country, and it contains, besides a cooking arrangement, pantry, pump, and two folding beds, a complete quartz mill. This is driven by belt connection with the 30-hp. engine that drives the car. The automobile is constructed very solidly, and the power is geared very low, the highest speed being about 15 miles an hour. The wheels are of iron, with pneumatic tires. The interior of the car is finished in mahogany and plate glass, and has all the comforts of a home.

Frame grain elevators are rapidly becoming a thing of the past, owing to the ever-present danger of fire. In their places are being built fireproof elevators and tanks.

MOTOR TRICYCLE FIRE APPARATUS

The fire-fighting vehicle shown in this illustration is one of the most im-

Courtesy Gas Power

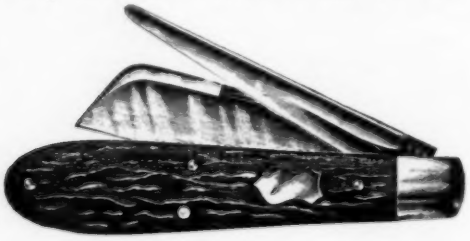
Powerful but Small Fire-Fighter

portant units of the fire department of Beckenham, England. In its brief period of service it has been sent out in response to alarm more than 100 times, and each time has arrived ahead of the other apparatus.

It consists of a motor tricycle, driven by a 7-hp. twin motor, and equipped with light ladders, hose, axes, lanterns, tools, and other implements which might be useful. It carries a crew of two firemen.

A NEW PUNCH KNIFE

A common pocket knife with one of the blades made for cutting small round holes is the recent invention of a knife manufacturer. The punch blade with the knife-like edge on one side will easily cut round holes in leather, and is

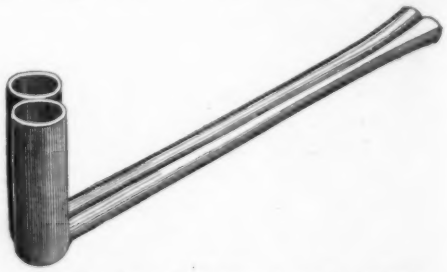


useful as a reamer or a gimlet for cutting holes in wood. The punch blade will be found very useful in repairing belts and harness by farmers, horsemen, machinists and engineers.

A PIPE OF GREAT CAPACITY

The German pipe with its cavernous bowl has long held the reputation of providing a longer smoke than any other type of pipe, but this double-barrelled affair not only provides a long period of steady smoking but lots of it. It is cut out of a solid piece of very hard wood, is 7¾ in. long, and each bowl has a depth of 3 in. Many pipes of the same type, although most of them are single-barrelled, are found in the British African colonies.

Although no reason for the double bowls, other than that they provide a heavy smoke, is given, it would seem that such a combination provides the smoker with the flavor of two kinds of tobacco without the necessity of blending them. The smoke drawn



Blending the Smoke Instead of the Tobacco

from the two bowls blends, of course, in the mouth, and the effect is practically the same as when the tobaccos are blended before smoking.

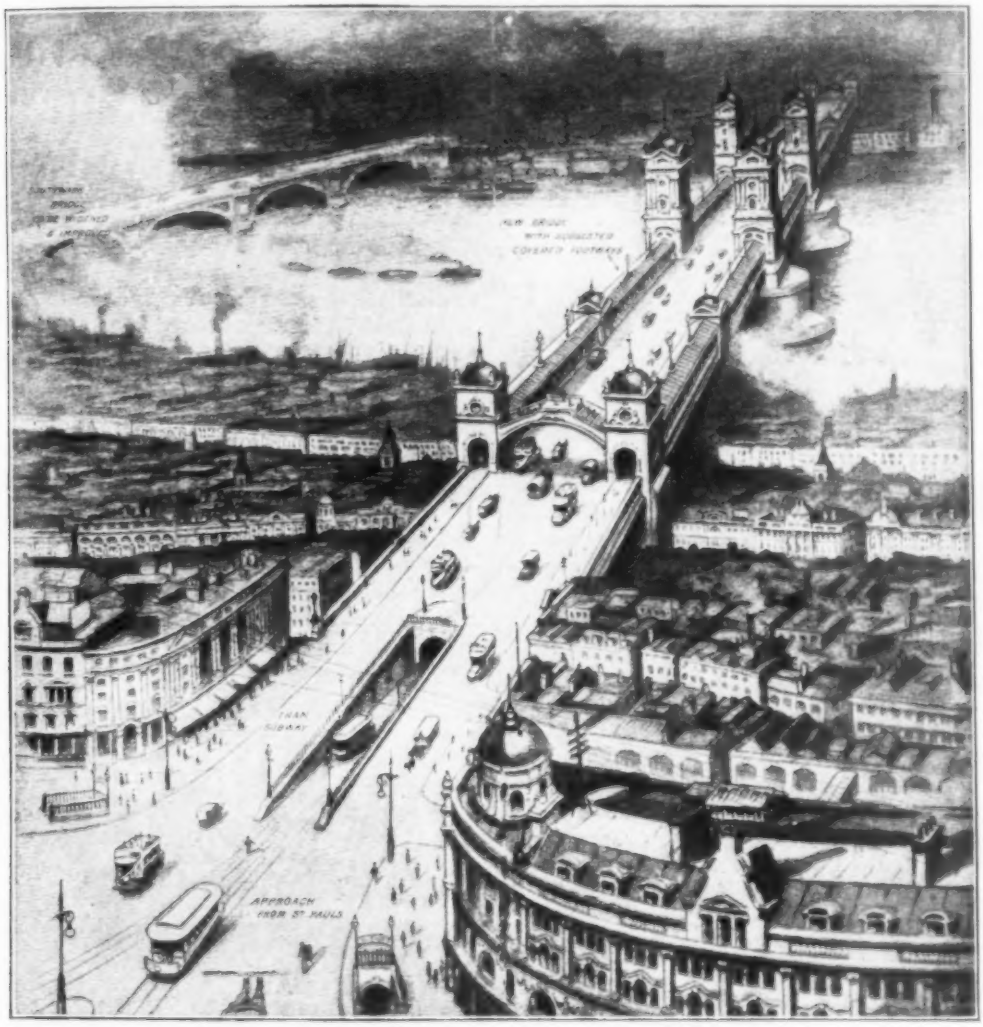
FIRE EXTINGUISHED BY BUTTERMILK

A plentiful supply of buttermilk is credited with having saved the town of Fennimore, Wis., when it was threatened with destruction by fire recently. A large creamery caught fire. Water was scarce in the vicinity and the fire began to spread to adjoining buildings. The five hundred people of the town bent their energies on putting it out. A bucket brigade was formed, and hundreds of buckets of buttermilk, secured from the creamery vats, confined the fire to the building where it originated.

PROPOSED BRIDGE FOR LONDON

English architects are soon to begin work on the plans for a great new bridge across the Thames from St. Paul's to the south bank, London, and in the meantime the press of England is strongly advocating the including of covered foot-ways in the estimates. Some idea of how the new bridge would look if provided with covered foot-ways is shown in the accompanying illustration, which likewise shows the great distances the ends will extend over the land.

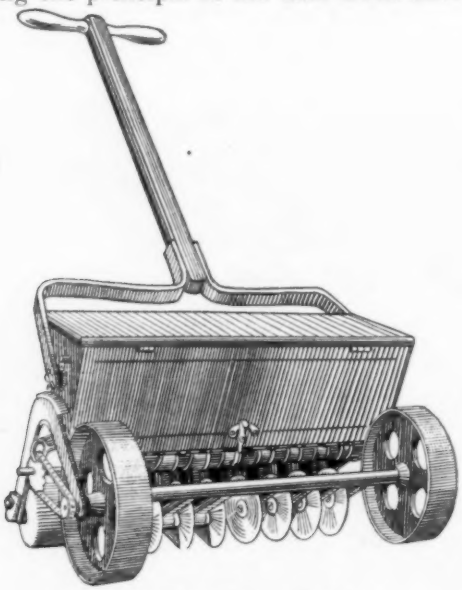
The idea, of course, of the covered foot-ways is to protect the thousands upon thousands of people who will cross the bridge daily from the cold winds that sweep along the river. At the same time, although the roadway is open from above, the inclosed foot-ways will form walls on either side to block the wind.



Covered Footways Proposed for Great Bridge

MACHINE FOR SEEDING LAWNS

This machine, not unlike a lawn mower in general shape, and embodying the principle of the disk drills used



New Type of Grass Seeder

in sowing wheat and oats, is designed for planting grass seed. It is the first machine of its kind for this purpose, and puts the seed in the ground, where it is safe from the wind and rain that often wash away seed sown broadcast.

The machine sows eight rows at a time on a strip 16 in. wide, and by its use an area of 70 sq. ft. can be gone over in an hour. The cutting action of the disks loosens the soil, relieves the sod of its root-bound condition, and cultivates. A heavy roller behind the row of disks firmly presses the soil down after the seed has been lodged.

JAPANESE CHERRY TREES FOR WASHINGTON

If the expectations of Japan and Washington, D. C., are not amiss the river bank in Potomac park of the latter place will be lined with a gorgeous 3-mile stretch of beautiful cherry blossoms this coming spring. A special consignment of 2,000 cherry trees, the gift of Tokyo to this nation's capital, arrived in Washington in January, and forthwith Col. Spencer Crosby, who has charge of the planting, prepared to stretch them along the river's bank in two lines, with the trees 20 ft. apart.

The gift resulted from it being made known to Tokyo by Japanese officials in this country that Mrs. Taft greatly admired the Japanese cherry trees. The trees, which include 110 varieties, as carefully selected as if they were to be planted in the imperial gardens of the Emperor of Japan, arrived in San Francisco the latter part of 1909, and were transported from the Pacific metropolis to Washington in three special cars.

The Japanese cherry tree is a hardy growth that converts the island kingdom into a bower of beauty in the spring. Some of the varieties have blossoms 2 in. in diameter, and the colors represented are scarlet, red, pink, and white, in many shades.

MOTORCYCLE TRICK RIDING

The trick bicycle rider had his day on the vaudeville circuits of this and other countries, in street exhibitions, and in the circus ring, then was gradu-

Trick Motorcycle Riders

ally left behind by the introduction of other and more startling novelties. Now, however, the trick bicycle rider

of former fame may find himself in the running again by adapting his feats to the requirements of the motorcycle.

That such tricks at a speed of 30 or more miles an hour are sufficiently thrilling to hold the interest of the modern audience is now being demonstrated by two German riders who are creating excitement abroad. They are shown facing to the rear in this illustration while the machines are running forward at a good speed.

CURIOUS ACCIDENT TO SUCTION DREDGE

The hydraulic dredge "Francis T. Simmons," which is one of the largest and most powerful dredges of its type on the Great Lakes, was sunk in a very novel manner while at work building new land off Lincoln Park, Chicago. The accident was caused by the forcing of a large rock through the suction pipe in the stern of the vessel, the hole thus made being about 20 in. in diameter. The inflow of water continued, regardless of the stopping of the pumps, until the vessel had settled to the level of her deadlights. The water pouring through these and through the tops of the ash chutes sank her in a few minutes.

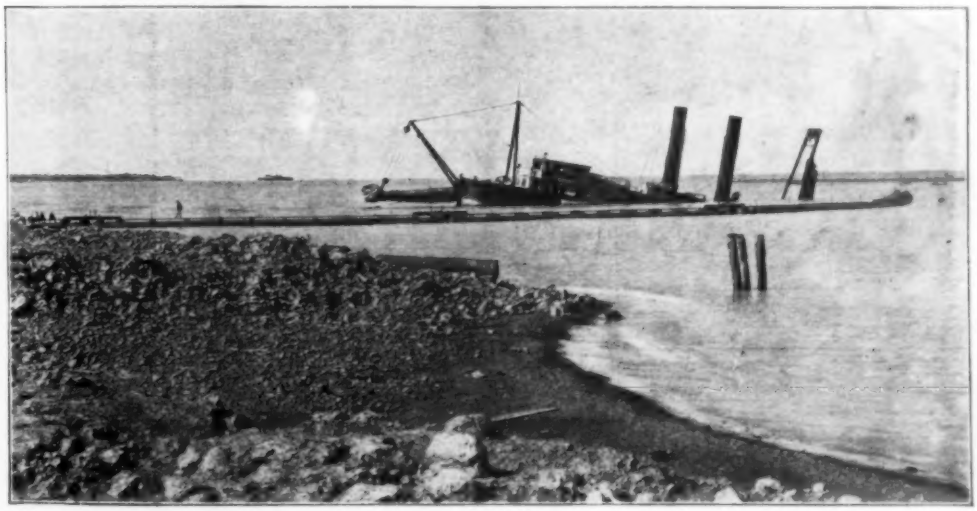
The first two attempts to raise the dredge were failures. Then a cofferdam was fastened to her stern, the water was pumped out, and she was successfully floated.

A HIPPOPOTAMUS TABLE

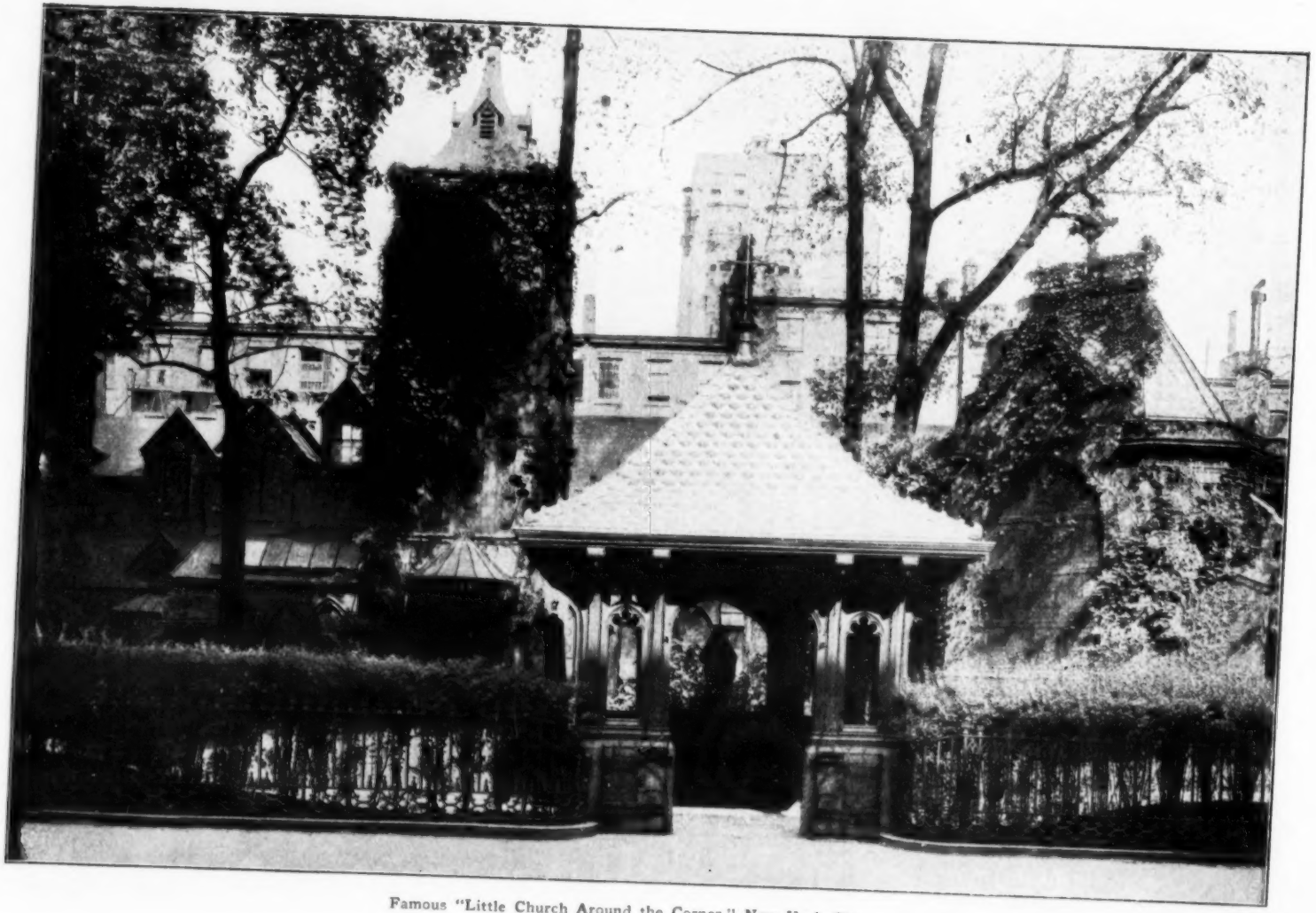
Trophies of the hunt are put to practical use by a South African official.

The Trophy Table

The piece of furniture shown in the illustration is probably the only hippopotamus table in captivity. The lower extremities were formerly the valued possessions of a hippo who was wont to wallow in jungle swamps, and the top of the table was the impenetrable hide of the same animal.



Dredge Sunk by Stone She Picked Up



Famous "Little Church Around the Corner," New York City

A CHAUFFEUR'S HEAD-LAMP

When the necessity arises to crawl under the automobile or to delve into dark nooks and corners of the machinery artificial illumination of some kind is necessary, and this generally means that one of the autoist's hands is required to hold the lamp. But by this arrangement both hands are left free for necessary work, and the light provided goes direct to the spot. The device consists of a small electric-light bulb and reflector fastened to a curved plate, which is held against the forehead by a rubber band. Current is supplied by a length of flexible wire running to the batteries of the car.

NEW MOTORING HOOD

All types of automobiling headgear for women are giving way to the automobile bonnet, now generally considered the only really satisfactory head covering for such a purpose. The bonnet, or hood, here illustrated is of waterproof silk, prettily arranged, and draped over the crown, forming a curtain, or collar, that completely protects the neck, back and front. It is a bonnet, storm collar, and helmet all in one garment.

Really Protective Auto Bonnet

SMALL TREES MAKE FINE BRAKES

The strain of pushing back in going down hill takes all the pleasure out of bicycle riding in the mountains, even with a coaster-brake. Cyclists in Colorado have learned a trick to do away with that. In riding through the mountains they carry a rope or piece of wire and when they come to a long hill they hitch a small tree or log to the frame as a drag. This allows the cyclist to pedal down hill and gives him better control over the wheel.

Saves Muscle on Down Grades

TRANSCONTINENTAL RAILROAD FOR AUSTRALIA

Reports have been completed and are now before the house of representatives of the Australian government for a proposed transcontinental railroad that will link up the eastern Australian states with the west. The great island stretches a distance of 2,500 miles east and west, and a complete line of road across would open a vast area of fine pastoral country, make available the military forces of the more densely populated states in case of need, and shorten the time of mails by several days' time.

SMALL FORTUNE IN 10 EARS OF CORN

Not only did these 10 ears of corn win the National Corn Association

The Prize-Winning Corn and the Prize

prize, shown above them, but before the close of the Omaha exposition they were sold for $335, being considered worth that price as seed. The ears were grown by J. H. Overstreet of Franklin, Ind., and won more than $1,000 for him. They were given the name "Champion Sweepstakes Ears."

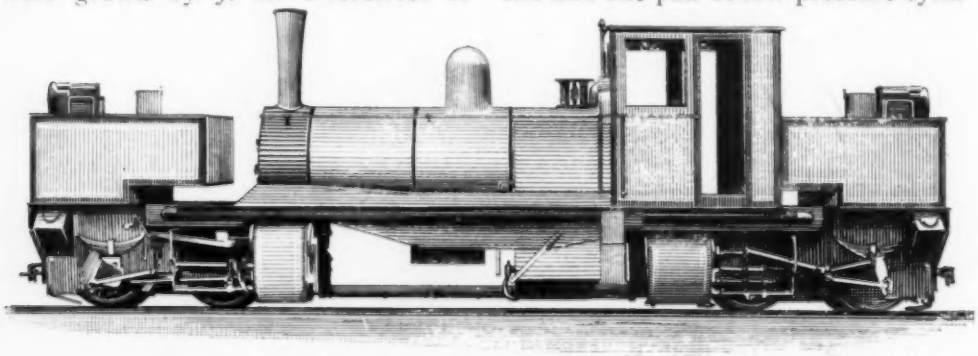
GROWTH OF GAS-PRODUCER POWER PLANTS

More than 500 producer-gas power plants, ranging in size from 15 to 6,000 hp. are now in operation in the United States. Through such plants the internal-combustion engine has become a serious rival of the steam engine in many of its applications. Only nine years ago a 600-hp. engine exhibited at the Paris exposition was regarded as a wonder, but today 4-cycle, twin-tandem, double-acting engines of 2,000 to 3,500 hp. can be found in nearly all well-equipped steel plants, and in some plants contain units rated at 5,400 hp.

This wonderful advancement in gas engines was made possible by improvements in the production of cheap gas directly from fuel by means of the gas producer. According to a report of the U. S. geological survey the plants as a whole are giving remarkable satisfaction in view of the brief period of development, and the most serious difficulty arises from the lack of competent operators to run them.

LOCOMOTIVE OF NOVEL DESIGN

This new locomotive of the Tasmania government is of a novel articulated design. It has one pair of high-pressure cylinders situated at the rear end and one pair of low-pressure cylin-



Courtesy Locomotive Engineering

A Unique Locomotive

ders at the front. The most novel feature is that when the locomotive is running ahead the leading engine is practically "backing up," while the rear engine is running forward.

The engine frame is practically a bridge girder supported at each end on pivot points through which steam and exhaust connections are made. The fuel space is at the rear and holds a ton of coal and 320 gal. of water. The forward tank, which contains water only, has a capacity of 320 gal.

A PHONOGRAPH KIOSK

The building of a kiosk for the express purpose of housing a phonograph

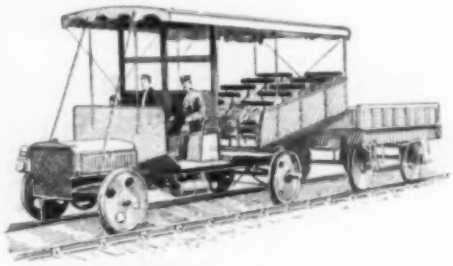
Courtesy Australasian Traveller

Garden House for Phonograph

is rather a new departure, but one that is gaining much favor in Sydney, Australia. The kiosk shown in the illustration is in the back garden of a suburban home. It is an 8-sided little structure, and in six of the sides are swinging windows through which the horn of the phonograph can be protruded. A shelf under each window holds the horn in position.

AUTO-RAILROAD CAR

The Caledonian railroad, Scotland, runs this unique auto-railroad car between Connel Ferry and Benderloch. It is in reality a train, consisting of a motive section, passenger section, and baggage car. The seats for the passengers are arranged in the same man-



Automobiling on a Railroad

ner as those of the familiar metropolitan sight-seeing auto, which gives all an excellent view.

SPECIAL COLLARS FOR AERIAL SPECTATORS

The discomfort of the person who gazes for any length of time at something above his head is so obvious that a witty London artist, in a moment of great mental activity, conceived and drew a practical demonstration of a collar that would do away with much of the pain inflicted by the ordinary collar. In fact, his idea is nothing more than

Courtesy London Motor

Jocular Remedy for a Serious Discomfort

At Top of Skyscraper

Start of the Ascent

an ordinary collar with a part of the back cut out. Just how effectual the idea might be is shown by the central figure in the drawing.

SWINGING IN SPACE FOR CHARITY'S SAKE

Standing on a rudely fashioned workman's platform, with thousands of onlookers gaping upward from the street, a St. Joseph, Mo., woman, was hoisted up to the level of the top of a 12-story building in course of erection, and won a $20 bet for charity.

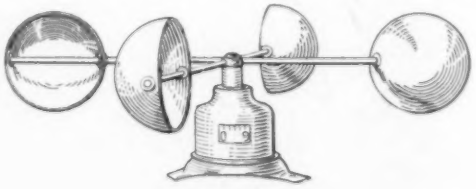
The platform was attached to the chains by which huge granite blocks and steel beams were hoisted into position, and in spite of the swaying of the crude elevator in the air, she did not show a particle of fear.

While the crowds below watched the ascent and descent fearfully, Mrs. L. A. Kent, one of the leading charity workers of the city of St. Joseph, stood calmly on the platform, and when it touched the ground at the end of the perilous trip, stepped off with a laugh.

It was "tag day" in the city, and the charity workers were attaching tags to everyone, and collecting ten cents for each. A contractor, who was putting up a large office building, offered in a joking way to give $20 to any woman who would ascend on the platform. Mrs. Kent took up the offer immediately. In addition to winning the bet she sold the roses she took to the top for a dollar each.

AN AEROPLANE SPEEDOMETER

The anemometer, the instrument used to determine the velocity of the wind, has been annexed by aerial interests as a speedometer for flying craft. Provided with the usual spider and



Aerial Speedometer

cups, but with the scale especially calibrated (graduated in its scale), the

wheels to the propeller, and from the

Grape Vine Like a Tree

aerial speedometer is designed to be attached to the frame of an aeroplane, within sight of the aviator. It will show wind velocity from zero to 60 miles an hour, and by it the aviator may determine with fair accuracy the speed his machine is making.

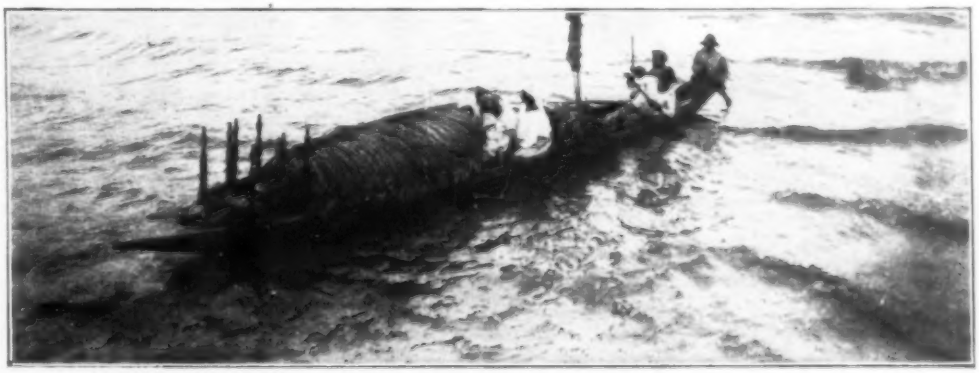
The instrument is small and light, the diameter in which its cups whirl being but 17½ in.

LARGEST GRAPE VINE IN WORLD

One of the most famed wonders of Southern California is the grape vine shown in this illustration. It is said to be the largest in the world, and has grown to such immense size that it now looks like a great shade tree. The vine was planted in 1771 by the Franciscan Fathers, who founded the mission of San Gabriel at that time. It is one of the oldest growing things in America planted by white men.

DUTCH GUIANA FARMER'S TRIP TO CITY UNIQUE

The poorer class of farmer in Dutch Guiana is obliged when traveling to and from his farm to the city on the rivers of that colony, to take along with him his whole household outfit. The trip often occupies several days, and the entire family usually goes along. A close inspection of the accompanying illustration will show two dining tables occupying the front end of the canoe. The rush covered section of the craft constitutes the sleeping quarters.



Dutch Guiana Farmer on Trip to Market

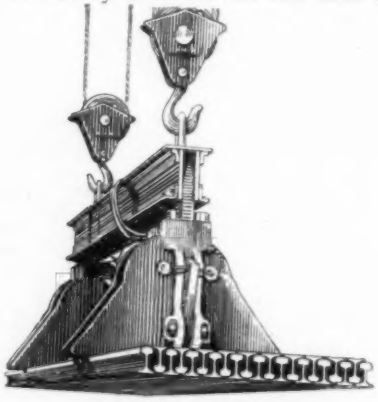
Scouting in the Boat-Automobile

AMPHIBIOUS AUTO ADOPTED BY FRENCH ARMY

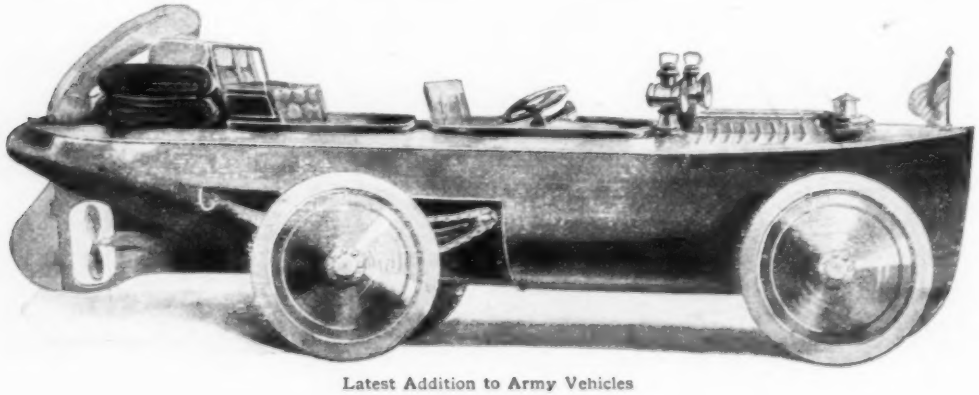
The idea of a combined automobile and motorboat is not an entirely new one, but the first vehicle of the kind to be officially taken up by any government is the invention of a French engineer. The French war office purchased it and assigned it to the use of an engineer-regiment. The war office believes it will prove of great service in scouting and in various other ways—for instance, for taking a line across a stream so that a temporary rope bridge may be fixed. The car has a 14-hp. engine, has a road speed of about 25 miles an hour, and a speed afloat of from 8 to 10 miles an hour. The transmission of the driving power from the wheels to the propeller, and from the propeller to the wheels, is quick and simple.

HANDLING RAILS WITH MAGNETS

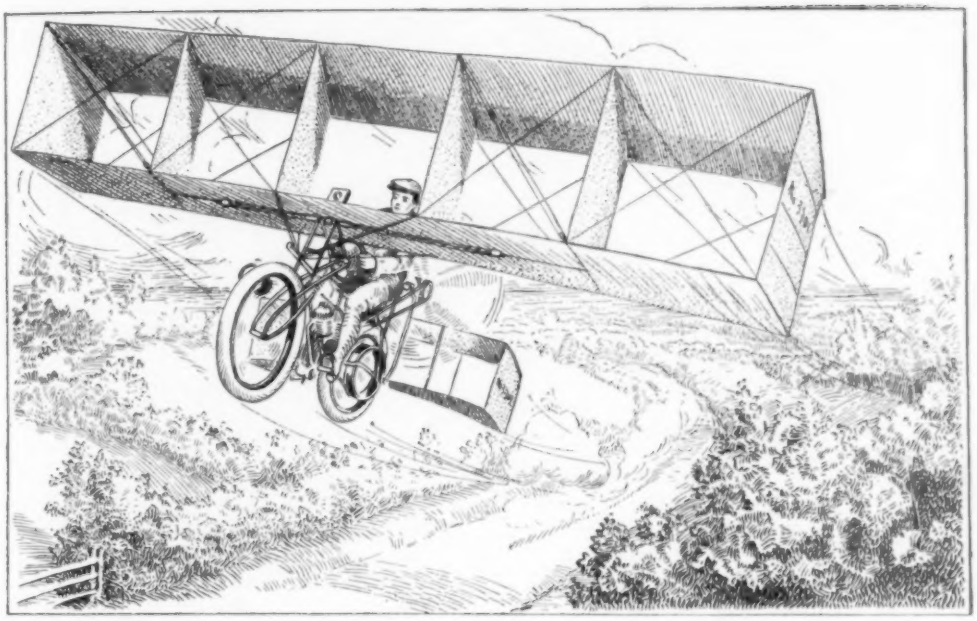
Among the up-to-date appliances to be found at the great steel plant at Gary, Ind., the most modern and largest concern of its kind in the world, are several rail-lifting magnets, one of which is seen in the accompanying illustration. It is lifting a locked section of 23 rails of 33-ft. length, weighing 10 tons. Special magnets had to be devised for this purpose because of the desirability of shipping the rails in locked sections. The difficulty arose from the fact that the top layer of rails practically short-circuits the magnetic field, and requires a very powerful and carefully designed magnet to penetrate through to the bottom layer of rails.



Rail-Lifting Magnet



Latest Addition to Army Vehicles



"Why not a motor-bicycle and aeroplane combined?" asks Motor Cycling of London, presenting this sketch. And considering what has been accomplished who can say we will not have such a combination within a few years.

NEW YORK HOTEL HAS WONDERFUL ORGAN

The Hotel Astor, of New York, now boasts of the largest pipe organ in the United States, and one of the largest in the world. Such an instrument of any size is an innovation in hotel fixtures, and as such is of more than usual interest.

The great organ represents all orchestral instruments, and its many speaking stops, nearly 100, make the tonal resources of the instrument almost inexhaustible. It is divided into four distinct divisions, the main organ occupying two chambers on the east and west sides of the ball room. The other two divisions are arranged on either side of the "L'Orangerie" room. Completely hidden from view by the decorations of the walls and ceilings, the music comes as a surprise.

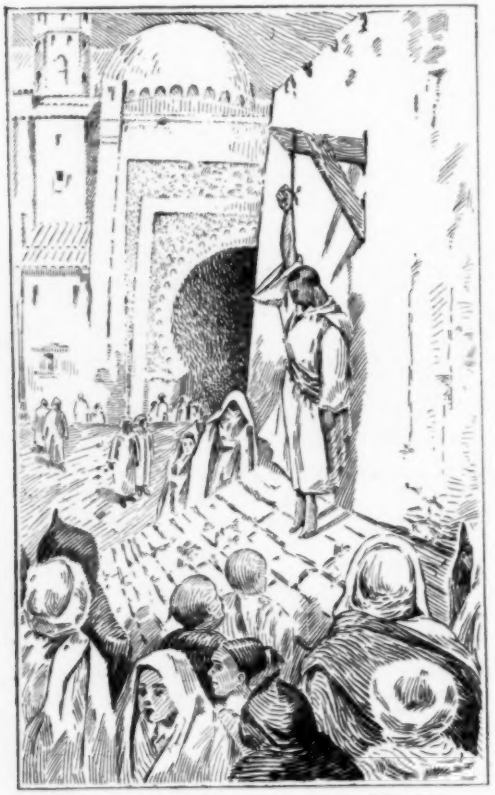
The pipes, varying from 32 ft. in length to only a fraction of an inch, are hundreds of feet away from the playing cabinet containing the keys and stops, and each one is operated by its individual train of electro-pneumatic action. The pressure of a key gives current to a wire that finds its way through various cables and switches to a magnet, which operates pneumatic mechanism that opens a valve and gives pressure to the pipe.

FOOTBALL ARMOR

Owing to the many serious football accidents during the last season of the game, manufacturers of sporting goods are making efforts to provide more effective safeguards, one of which is shown in this illustration. It is a shoulder pad made of soft leather, padded with felt and reinforced across the shoulders with heavier leather. It affords protection to the shoulders, collar and breastbone, and is adjustable in size to fit any player.

PUNISHING DISHONEST MERCHANTS

Morocco takes no half-way measures, and punishment for petty crimes, especially, is meted out in a way as barbarous as was prevalent in England and European countries a couple of hundred years ago. The illustration shows a merchant of Fez hanging by one wrist from a gibbet. Beneath his feet is a slanting floor which he can barely touch by standing on his toes. He remains in this position from sunrise to sunset, a mark for stones and refuse thrown by children, and jeers hurled at him by the crowd. His offense was giving false weight.



Moroccan Punishment for False Weighing

General Botha, prime minister of the Transvaal, says that never before in the history of South Africa has there been such solid signs of prosperity.

THE SELDEN PATENT CASE

Although much has been heard about the Selden patent case, which has been dragging through the courts for many years, beyond the fact that it had something to do with automobiles the public knows comparatively little about it. Recently a United States circuit court handed down a decision upholding the patent. It was originally filed by George B. Selden in 1879, but was not granted until 1895. It has been the subject of litigation ever since, and it expires in 1912.

Selden claimed a patent on "the combination with a road locomotive, provided with suitable running gear, including a propelling wheel, and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more cylinders, with suitable fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, and a suitable carriage body adapted to the conveyance of persons or goods, substantially as described."

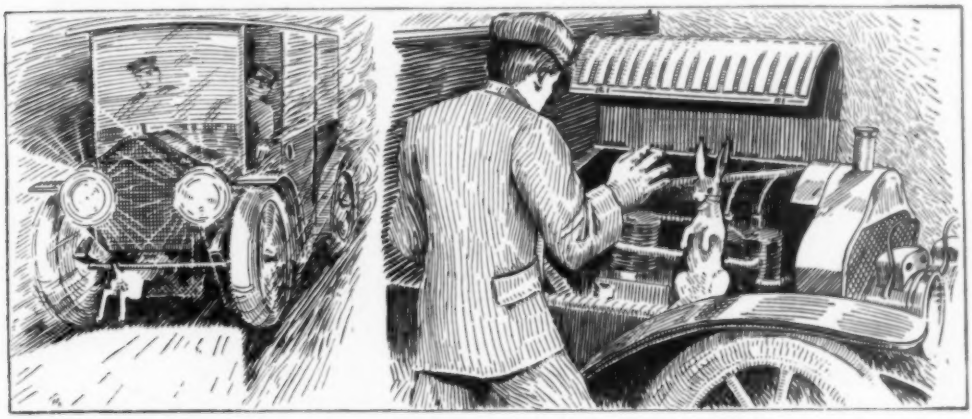
This comprises all the principal features of the modern automobile, and although none of them were new at the time the patent was asked for, they were patented as a combination. Half a million dollars has been spent in its litigation. Many of the automobile manufacturers have been paying the holders of the patent a royalty, while others have ignored it.

The case will probably be carried to the Supreme Court, and if that body upholds its validity, those manufacturers who have ignored it may have to pay millions of dollars in royalties.

RABBIT TAKES CURIOUS AUTO RIDE

While a physician of Carlisle, England, was driving his automobile along a country road some distance from that city, a wild rabbit ran in front of the car and disappeared from view, apparently run over. Next morning, on lifting the bonnet of the car preparatory to start-

ing, the chauffeur was astonished to find the rabbit seated on the top of the carburetor, very much alive. It had evidently jumped in through the small space between the radiator and number plate, notwithstanding the fact that the machine was running at a speed of about 20 miles an hour. It maintained its position amid the operating levers, the carburetor and synchronizer during the six-mile run into Carlisle, but appeared unhurt, although a quantity of fur adhering to the under surface of the radiator and the electrical connection attested to its rough passage into the bonnet.



Rabbit Has Unexpected Trip

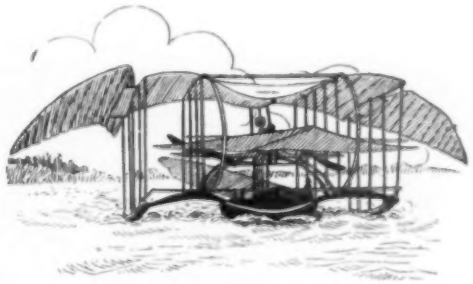
It is not an unusual sight to see rabbits jump out into the road and disport themselves in the glare of the headlights when passing through England's country districts.

BRITISH AEROPLANE STARTS FROM WATER

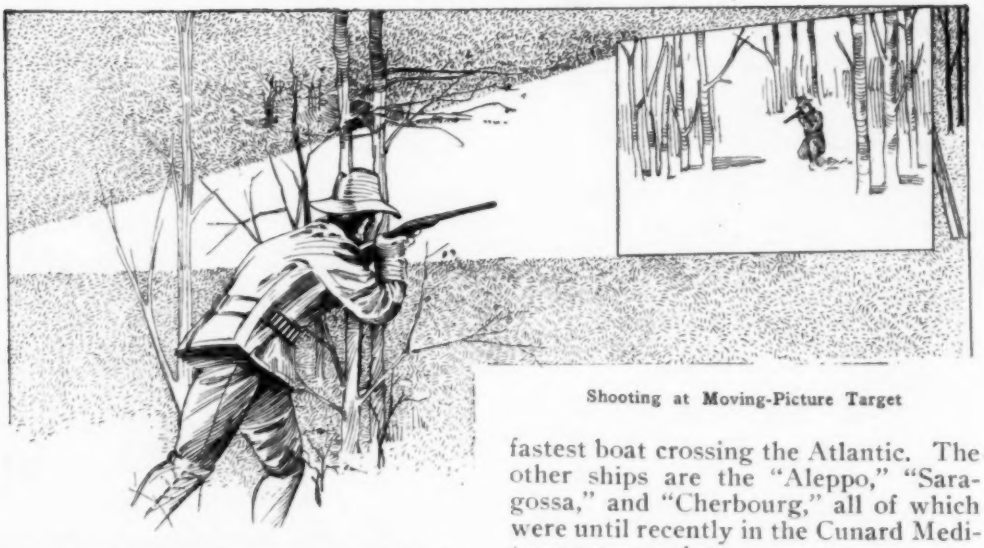
An aeroplane that starts from the water has been built by an Englishman, and while its first tests demonstrated the necessity of many changes, the inventor and his friends have great faith in its practicability. The machine is called the "Humphreys," named after the builder. The biplane system has been adopted, but at that the similarity to the standard type ceases. It is a sort of biplane bird.

The top plane is fashioned in two transversely-bowed planes, down the middle of which runs a vertical plane designed to steady the machine. To the extremities of the bowed planes are affixed triangular wings, slightly curved. The operation of these wings is intended to steer the machine. The lower plane is practically a replica of the upper one, save that it carries no wings. A triangular elevating and depressing plane is located in front.

The most original feature of the machine is the coracle hull of very thin wood in which the aviator sits while operating the machine, and which causes the aeroplane to float on the water. The motive power is an 8-cylinder, 35-hp. engine, driving two propellers through bevel gear. The machine, including the operator, weighs 1,750 lb.



The "Humphreys" Afloat



Shooting at Moving-Picture Target

MOVING-PICTURE TARGETS

The latest target idea in Europe is a moving-picture figure which appears in the open with gun in hand and fires back at the marksman firing upon it. The practicing marksman holds his rifle in readiness to fire the moment the figure appears on the screen, but if the flash of the gun held by the moving-picture figure, and pointed directly to the spot where the marksman stands, is seen before the marksman fires, the latter is theoretically dead. Or should he fire and miss the moving figure, he is numbered among the dead. The hits of the marksman are all recorded in their proper places by a self-recording signal.

The target not only requires accurate shooting, but rapid shooting, and very much resembles a battle in which opposing sharp-shooters are trying to pick each other off.

ANTIQUATED LINERS TO BE BROKEN UP

The Cunard company has sold four of its out-of-date liners to a great iron works at Sheffield, England, where they will be broken up for the material they contain. One of the vessels thus doomed to sail the seas no more is the "Etruria," which in its day was the fastest boat crossing the Atlantic. The other ships are the "Aleppo," "Saragossa," and "Cherbourg," all of which were until recently in the Cunard Mediterranean service.

The fact that these vessels are to be really broken up signifies that English shipowners are wisely ridding themselves of obsolete ships in a way that will not counteract, and that the demand for old iron is steadily growing. Formerly, obsolete ships were sold to foreign companies at breaking-up prices, only to enter the service again and compete with newer ships. Thus, by breaking up old ships, instead of selling them to foreign buyers, the market is relieved of superfluous tonnage and raw material is provided for new ships.

VALISE FOR DOGS

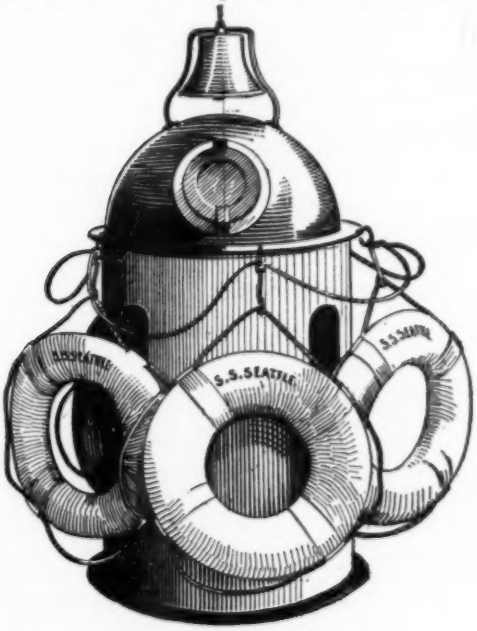
The variety of canine coming under the head of lap-dog usually has to be carried about as often as it walks, with the result that her ladyship's gown is often soiled and scratched. Consequently, an ingenious manufacturer of leather goods devised the dog valise here illustrated. An opening is provided at one end for the dog's head to protrude, and a pair of leather handles makes the carrying simple.

WRECK-LOCATING AND LIFE-SAVING BUOY

This curious buoy, designed for vessels navigating inland waters or in coast service, has three distinct purposes. Its main purpose is to mark the position of foundered vessels, but it likewise provides a safe receptacle for important papers and small articles of value, or to assist in saving the lives of passengers and crew.

The invention consists of a buoy held in a cylindrical framework, the latter being securely bolted to the deck. In the lower part of the framework is a reel, carrying a light metallic cable. When a vessel sinks, the buoy floats on the surface, the cable unwinding as the vessel settles to the bottom. Being thus moored to the wreck, the buoy marks its position.

Inside the buoy is a compartment, reached through a watertight handhole, which may be used for storing important papers, rations, and stimulants. At the top is a bell, which,



Buoy for Triple Purpose

rocked by the action of the sea, attracts attention to the position, and around the sides are hung a number of life preservers.

A TARGET-GOAT

The Ham and Petersham Rifle club, a famous English sportsmen's organi-

The Proudest Goat in England

zation, takes great pride in the possession of a ruminating mascot, a goat who is a living target. This Billy, who occupies a proud position among the goat tribes, owes his exalted place simply to this fact. Aside from his peculiar coloring he is a common, garden variety of goat. He only knows one trick. When he spies a man with a shotgun, he turns his right side to him, lest the temptation to shoot at the target on his left side be too great to be resisted.

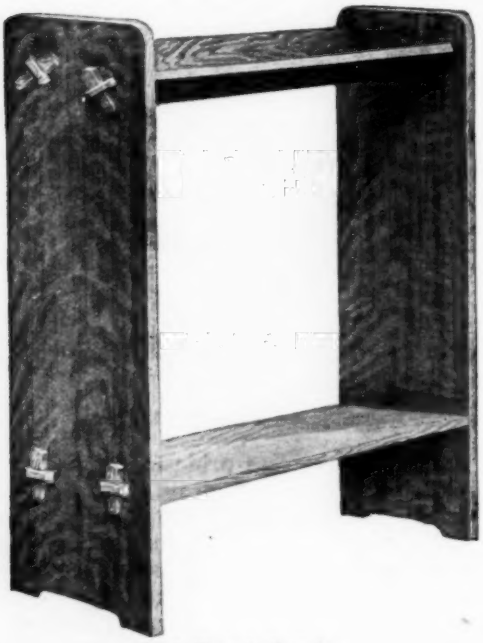
HOW TO MAKE A BOOK TROUGH

A very cheap but attractive book trough is shown in the accompanying photograph. This piece of mission furniture will be found useful in the home or office and can be made by anyone who has a slight knowledge of tools. The material should be either oak or chestnut, which can be secured from the planing mill dressed and sandpapered ready to cut the tenons and mortises. The stock needed will be as follows:

2 ends, ⅞ in. by 10 in. by 31 in., S-2-S.
1 shelf, ⅞ in. by 10 in. by 35 in., S-1-S.
2 trough pieces, ⅞ in. by 4 in. by 35 in., S-2-S.
8 keys, ⅜ in. by ⅜ in. by 3 in.

The two end pieces should be made first with the top corners rounded off and the lower end, which is of simple

design, can be cut out with a bracket saw and smoothed with a wood rasp. The mortises should then be laid out



Book Trough Complete

according to the sketch and cut, by first boring ¾-in. holes and finishing with a chisel, being careful to keep all edges clean and free from slivers.

The shelf can now be made by cutting a double-key tenon at each end to fit the end pieces. The space between the two tenons at each end can be cut out with a bracket saw and finished with a rasp. The key holes should be mortised as shown in the sketch. The trough pieces are made in a similar manner, care being taken to have all tenons and mortises perfectly square and a good fit, so the trough when assembled will have a neat and workmanship like appearance. The trough can be finished in any one of the many mission finishes which are supplied by the trade for this purpose.

FIRE HORSE OBEYS PHONE ORDER

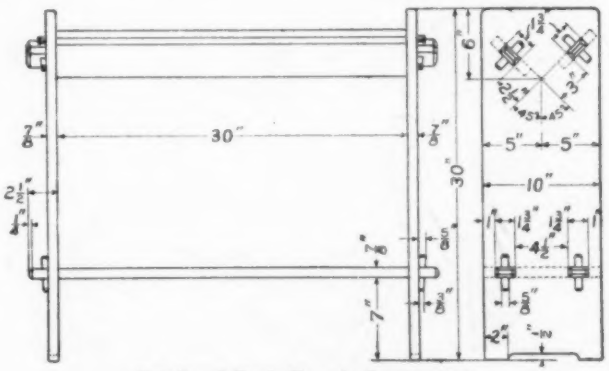
A curious and remarkable story of "horse sense," or nonsense, was recently published in a firemen's magazine about a horse of the South Norwalk, Conn., fire department. Samuel W. McGowan, the regular driver of the truck, was at his home for a week of vacation, and when the one fire alarm of that week was sounded the horse refused to get into harness. McGowan was called up when it was found that nothing could be done, and the animal was led to the phone.

"Jack, what's the matter with you? Get out of there quick!" came the driver's familiar voice over the phone.

Nothing proved to be the matter but that the horse had missed his regular driver's commanding voice, and a moment after the phone order was heard he jumped into his place. The fire, however, caused the total destruction of a $30,000 building.

CO-OPERATIVE COAL MINE FAILS

Some years ago a co-operative coal mine, in which the miners owned the shares and controlled the operation, was inaugurated near St. Etienne



Details of Book Trough Construction

France, with many promises of success, but not more than a year ago ended in absolute failure.

The idea of a mine worked by the

miners themselves as proprietors was put forward by one of the newspapers of Paris, which subscribed $10,000 for the venture. The government then added $10,000 more to the fund, and St. Etienne came forward with a donation of $2,000. Operations were commenced after a concession of four pits had been secured, but the miners were not like brethren dwelling together in unity, and hot disputes arose. The miners believed that they could manage the business better than the usual board of directors and save expenses by more efficiency in carrying out the work, but too many tried to manage, and therein lay the cause of the failure.

It is to be constructed of unbarked logs with the ends hewn tapered, and is to be 64 ft. long by 38 ft. wide. The interior on the ground floor will be composed of rooms for the accommodation of the public, and the attic will consist of living rooms. At the angles the logs are to be notched one over the other in the genuine settler style, and will be edged off top and bottom to allow about 3 in. flat surface for bearing. The joints will be calked with tarred oakum and plastered with ordinary mortar. The roof will be covered with split shingles or shakes, and the chimney and fireplace will be constructed of field stones.

Modern Railroad Station of Logs

ARTISTIC RAILWAY STATION OF LOGS

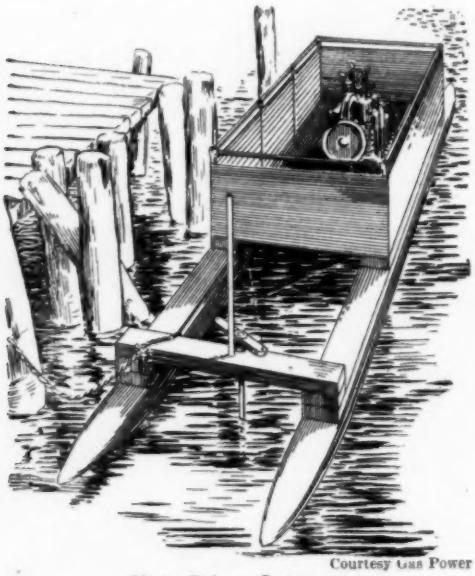
That a reversion to the building materials used by the early settlers of this country is the order of things in many parts of the west, especially where artistic as well as practical and inexpensive buildings are desired, is being demonstrated in many ways. Large log hotels have been recently erected in the Yellowstone Park and at Hot Springs, South Dakota, and now the Chicago, Milwaukee & Puget Sound railroad has prepared plans for several log stations. One of them, which is here illustrated, is to be at Musselshell, Montana.

METAL BEATERS FOR EXTINGUISHING BUSH FIRES

Bush fires in Australia are usually fought by gangs of men who drive the flames back with hide, fiber, or metal beaters, the latter being a new invention consisting of a flexible metal beard or switch attached to a stout wooden handle. Although light, the metal beater is strong enough to sweep embers and blazing sticks back into the fire, and when wielded with an easy, sliding stroke in towards the line of fire it neither fans nor spreads the outbreak. The fact that it will not itself catch fire is a further advantage over the beaters of hide or fiber.

A CATAMARAN MOTORBOAT

This curious catamaran motorboat, the property of a water enthusiast in Janesville, Wis., attains a speed of 18



Courtesy Gas Power

Motor-Driven Catamaran

miles an hour, although equipped with a light engine of but 6 hp. Its length is 30 ft., the beams 3½ ft., and it consists of twin hulls or tubes, 11⅛ in. in diameter. The tubes are made of galvanized iron, and upon them rests a platform 14 ft. long. This platform, provided with a railing and canvas sides, contains the engine and steering wheel, and furnishes a riding place for one or more persons.

The boat is so light on the water that it takes its highest speed just about as quickly as the motor is opened up, and, by the adjustment of ingenious balancing weights, runs on a level keel, the stern not even settling when running at highest speed. The rudder, as is shown in the illustration, is arranged on a crosspiece near the bow, this proving necessary because it retarded the speed when located at the stern.

On the shaft near the motor is an air pump, the purpose of which is to keep a pressure of air in the hulls at all times. Pressure gauges for each tube are arranged on each side of the pump.

ENGLISH "FAKE" CURES ARE EXPOSED

The British medical association has published an interesting little book in which are exposed the well-known secret remedies to be found in almost every English household. In the book are to be seen the composition of most of the much-advertised nostrums contrasted with extracts of advertisements telling of the cures they will make. In many instances the ingredients include useful drugs, but the selling price is out of all proportion to the cost of preparation. In other preparations the ingredients are harmless though useless, and in others, decidedly dangerous.

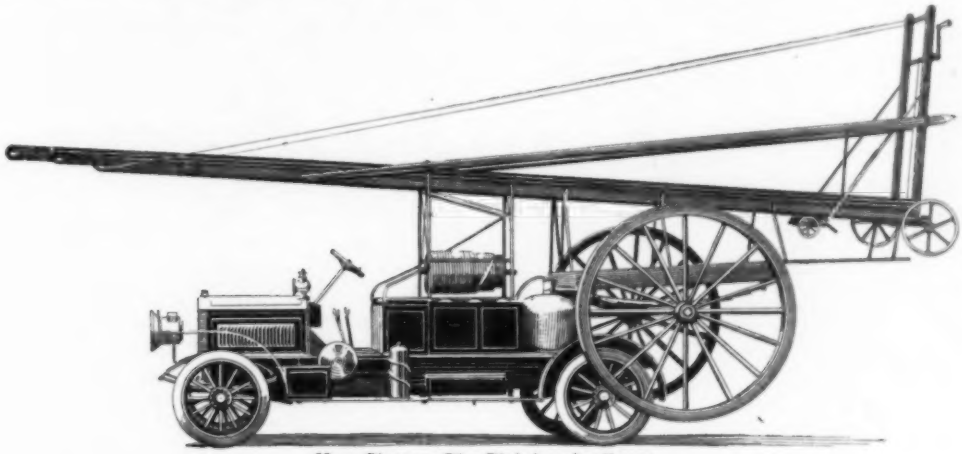
The majority of remedies advertised for the reduction of fat contain an extract from seaweed bladder wrack, which, notwithstanding the fact that it is used in Ireland for fattening pigs, has in some way or other acquired a reputation for making people thin.

Although in some instances the secret remedies, though expensive, may prove effective, the majority are shown to be a cruel fraud upon the sufferers, whom they often prevent from obtaining skilled advice before it is too late. One of the most widely advertised cures for cancer, for instance, has been found to consist of nothing but water.

MOTOR FIRE ESCAPE LATEST IN MOTOR LINE

Motor fire appliances have ceased to be a novelty, but all over the world an effort is being made to make them more effective and enlarge their scope of usefulness. The Glasgow fire department has just made a notable addition to its fire-fighting apparatus, a motor fire escape. The machine carries an extension ladder which operates on a turntable and can be extended to a height of 85 ft. When traveling, the machine is 26 ft. long, 10 ft. high, weighs 6½ tons, and is driven by a four-cylinder, 30-hp. gasoline motor with battery and magneto ignition. The gasoline motor drives a dynamo

generator, which transmits the current through flexible cables to two electric motors, hung on the front axle and geared up to the front wheels. There are five speeds forward, up to 20 miles an hour, two reverse, and electric brake of two powers. The ladder, when raised from its horizontal position on the carriage, is extended by means of a small engine, bolted to the side of the main ladder and driven by carbonic acid gas, the gas being contained in four cylinders attached to the turntable. The weight of the ladder does not rest on the springs of the apparatus, but on a carriage which is carried on the rear of the machine, and which can be detached so that the wheels may rest on the ground.



New Glasgow Fire-Fighting Appliance

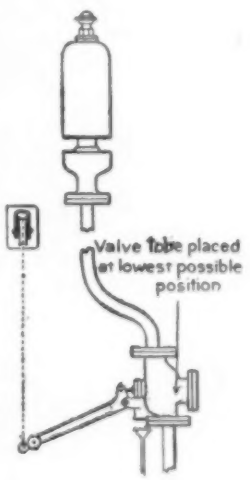
EVOLUTION OF THE RABBIT

Australia, long suffering from its over-production of rabbits, has spent millions of dollars in an attempt to keep the little animal out of mischief, and yet, regardless of discomfiture that would make most people incapable of joking on the subject of their trouble, the Australian ranchmen are circulating a most ingenious story of rabbit evolution.

It is none other than a reputed demonstration of the Darwinian theory in the rabbit. Australia, according to the story tellers, sees to her dismay the rabbit developing long toe-nails in order to climb over the settlers' wire netting fence, and in a few years, so some affirm, it will be found that Bre'r Rabbit has grown himself a pair of tweezers with which to cut the wire.

A DRAIN FOR STEAM WHISTLES

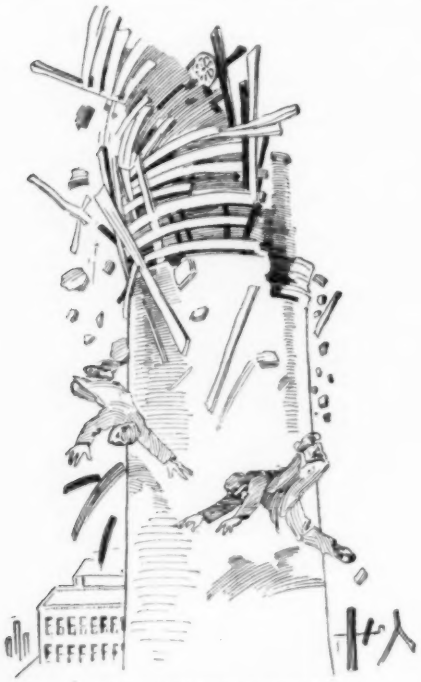
The gurgling and spluttering of a steam whistle, and the time wasted before a true and full note is obtained, is the result of the condensation of the steam left in the whistle after the previous signal. This trouble may be obviated by the adoption of the drain shown in the illustration. As soon as the cord is pulled it automatically drains away the condensed steam, leaving the steam-pipe dry and clean.



With such a device attached, the sound of the whistle is immediate and of full note, and spray is not blown all over the deck, as is the case when the condensed steam has to be blown out before a sound can be made.

UNSET CONCRETE KILLS MEN

The falling apart of a 7-ft. section of a concrete smokestack under construction at Pontiac, Mich., sent two



How Accident Occurred

workmen crashing to the ground 160 ft. below, instantly killing both of them. The stack, which is to be 180 ft. high, rose in the air at the rate of 3½ ft. per day, the mixture being poured into forms made of planking.

The accident occurred just after the workmen had reached their posts on the morning of Nov. 19, and the cause was the imperfect hardening of the two sections built the two previous days, due to the cold weather.

THE FROG INDUSTRY OF FRANCE

That the frog industry of France is a business of considerable magnitude may be gained from the fact that the annual production is close to 50,000,000 frogs, all of which are consumed within the country, with the exception of the export to England.

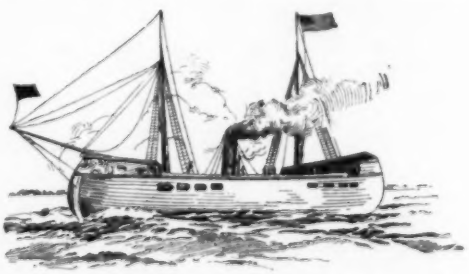
Of all the districts given over to the industry, that of Fresnes, a village in the environs of Paris, is the most famed. Great ponds are alive with the jumping animals, and the catch, which is made in the night, is a picturesque sight. Long lines of flaming faggots, soaked in tar and carried by small boys, catch the attention of the frogs in the midst of their nightly musical entertainments, and they jump towards the fatal flare. Men with nets follow the faggot bearers and catch as many as 25 or 30 fascinated frogs in one swing of the net.

The legs, or saddles, are served in omelettes, fricasseed in butter, fried in bread crumbs with a white sauce, grilled, prepared with beaten eggs, and in many other inviting ways. Magnificently "fattened" legs sell for about $1.50 per dozen.

A meat pie of frog's legs and truffles, ordered to celebrate an exceptional run of luck at Monte Carlo, cost the plunger a little matter of $120.

FIRST STEAM WAR VESSEL

The success of the "Clermont," Robert Fulton's invention, launched in 1807, caused the naval architects of the day to apply steam power to warships, and the "Damologos" or "Fulton the First," was launched in 1814, seven years after the first steamboat appeared on the Hudson river. She carried 16 guns, eight on a side, and at the time was considered a formidable craft,



An Early "Dreadnaught"

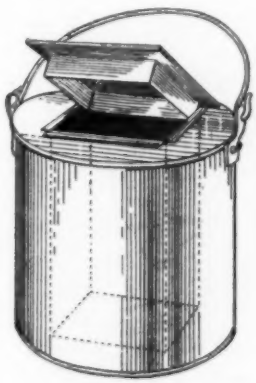
albeit there were sailing frigates and sloops which could leave the newfangled craft behind in a race.

OAKLAND'S NEW WATER-FRONT

Some time ago a bond issue of $2,500,000 was voted by Oakland, Cal., for the improvement of its waterfront, and of this amount $500,000 is about to be expended in developing the space between Key Route pier and Southern Pacific mole for commercial purposes. A street 6,500 ft. long and 200 ft. wide will run along what is known as the United States bulkhead line between these two points, and piers will be constructed. Three thoroughfares from the heart of the city will open into the new street. A 2,000-ft. wharf will be built, and the channel in front will be dredged out to accommodate deep-sea-going vessels.

KETTLE FOR THAWING DYNAMITE

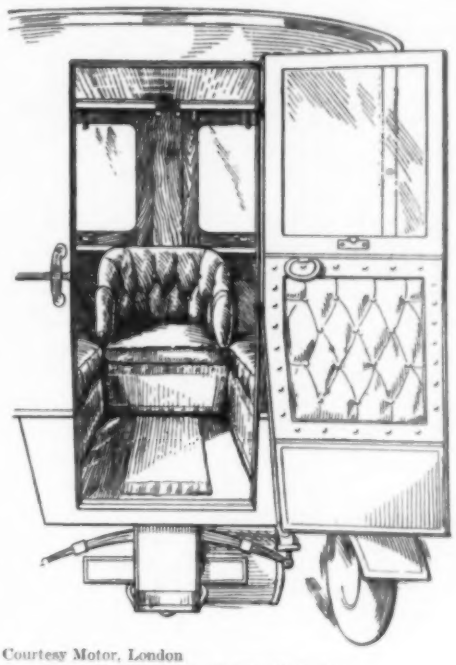
The thawing of dynamite requires precaution and a specially constructed thawing vessel, yet precaution is often lacking and the vessel in which the thawing is accomplished is seldom other than an ordinary utensil drafted into service for the moment only.



There is, however, a kettle on the market, designed for thawing dynamite and expected to do no other service. As shown in the illustration it is a galvanized-iron pail having two separate compartments, the inner one forming a chamber for the dynamite. Around this, in the outer compartment, is placed the hot water required for the thawing. The dynamite compartment has a close-fitting socket cover, and the opening of the water compartment is a small, screw-capped hole. The kettles are made in two sizes, capable of thawing 40 and 75 lb. of dynamite.

QUEEN OF SIAM'S AUTOMOBILE

The Queen of Siam is the latest royal convert to the use of the automobile as a means of transportation and pleasure.



Courtesy Motor, London
Interior of Royal Auto

Around the palace of the King at Bangkok are many miles of fine roads and gardens, and it is in this locality that the machine will be used.

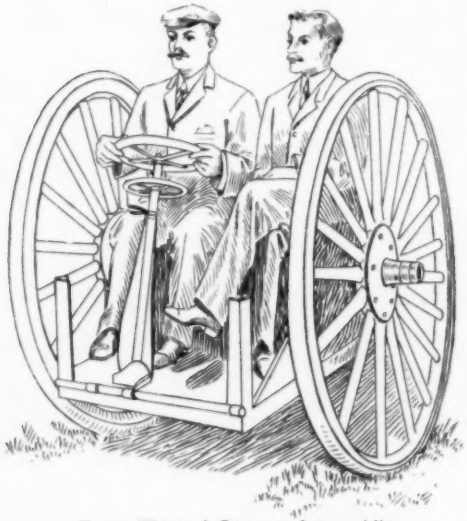
The royal automobile was made to order in England, and has a body like that of an omnibus. A large chair seat for the Queen occupies the center of the interior, and on either side of it are seats for the ladies in attendance upon her majesty.

REMARKABLE TWO-WHEELED AUTOMOBILE

A most extraordinary two-wheeled automobile, designed on the principle of a "dicycle" bicycle which drew attention in England 20 or more years ago, has been built in London and sent to this country for exhibition.

It consists of a couple of large solid-tired wheels, connected by an axle from which hangs a platform sufficing for

the engine, fuel tank, and two persons. The engine, which is at the rear, is of the single-cylinder type and develops



Front View of Strange Automobile

4½ hp. The countershaft lies parallel with the axle of the vehicle, and on the ends are a pair of roller chains driving sprockets that engage with the wheel hubs. The steering is accomplished by an ordinary auto steering wheel, which actuates wires that move friction discs between the sprockets and the wheel hubs, the drive being released from one wheel or the other to effect a turn.

The chief features of this remarkable type of machine is the cheapness with which it can be built and the lack of vibration that results from the use of large wheels. The seat for the driver and passenger rests just over the axle.

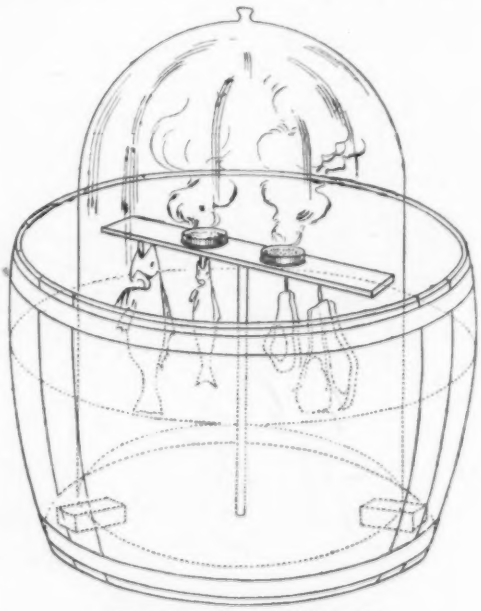
THE TELEPHONE IN SCIENCE HEALING

It is said that the use of the telephone for Christian Science healing in and around Los Angeles, Cal., has assumed such proportions that the business of the two telephone companies has materially increased. Healers in Los Angeles and Pasadena, according to "Telephony," give treatment by wire to patients in Riverside, Santa Barbara, San Bernardino and other southern California points. After the connection is made between the patient and the science healer, the wire is held in absolute silence. The telephone operators would, of course, get no response when cutting in on the line, consequently these broken connections on what appeared to be non-busy lines brought in complaint that the service was out of order, and led to the discovery of the silent use of the wires.

NOVEL METHOD OF PRESERVING MEAT AND FISH

This illustration shows an ingenious French method of preserving fish or meats for periods as long as eight or ten days without ice, yet the food is kept absolutely fresh. The requirements for making the preserver are simple, consisting of a wooden tub or half cask, a straight stick or broom handle, a cross-piece of wood for it, a glass bell, brimstone, sulphur, and water.

The tub is filled two-thirds full of water, and the articles to be preserved are hooked to the cross-piece of the



Preserving Meats Without Ice

broom handle. On top of the water near the center stick are placed two or-

dinary pill boxes, each containing a little powdered sulphur. This is lighted and over all is placed the glass bell, the lower edge of which rests under water on bricks or other objects placed on the bottom of the tub. The sulphuric acid given off absorbs the oxygen in the air under the bell-glass, and then dissolves itself in the water. It is claimed that when the meat or fish is removed several days later as fresh as when placed in the preserver, there is no smell of sulphur or brimstone whatever.

TELESCOPE SIGHT FOR RIFLES

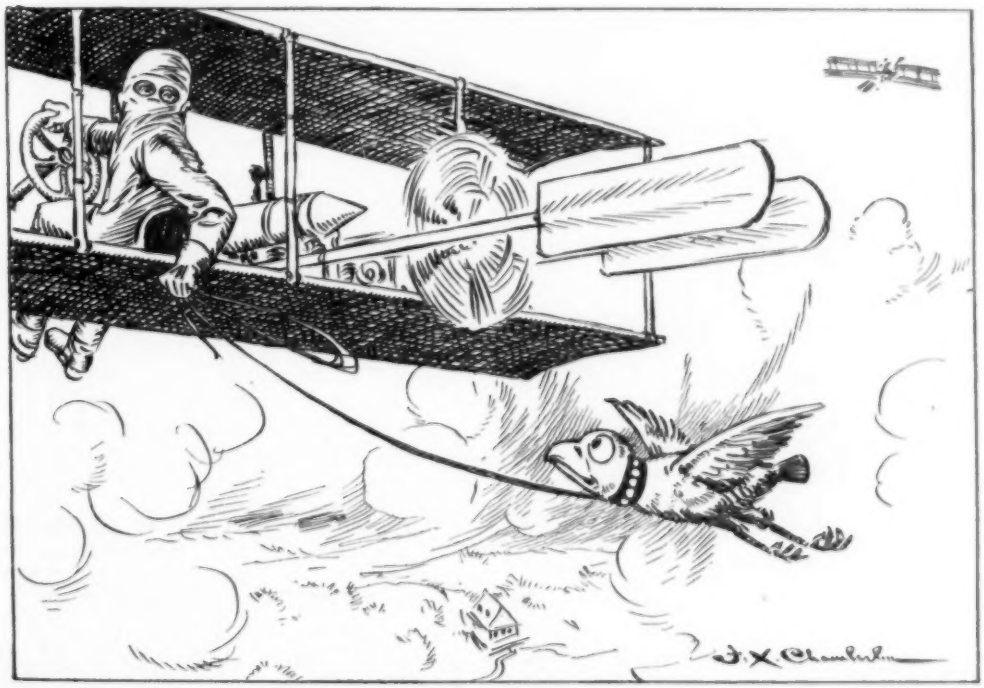
A new telescope sight has been placed on the market that is as long as the rifle barrel itself. It is 19½ in. long, has a power of three diameters, and the sight relief is 4¾ in. The rear end of the device is well in front of the breech block where it is out of the way of the shell. The mounting of the telescope is very simple, the rear holder taking the place of the ordinary rear sight and being held in place by the same screw. Just back of the muzzle

Telescope Sight as Long as Barrel

is a split dovetail mount which locks securely to the front sight slot.

THE AIRSHIP REPELLING TESTS

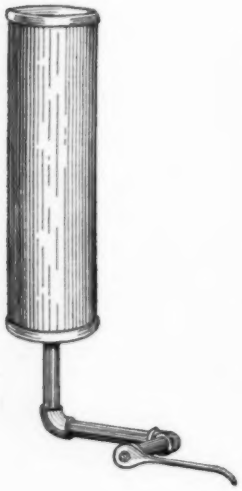
The tests at Fort Hancock, designed to perfect the army in fighting the aerial war craft of the future, and to develop new types of guns for this purpose, are progressing rapidly. Balloons are sent up as targets, and ordinary cannon are all that have so far been used. On one day a balloon withstood for several hours a shower of bursting shrapnel fired at it from the fort, but in another test a balloon was brought down by a shell.



The Aviator's Pet

WATER COOLER FOR REFRIGERATORS

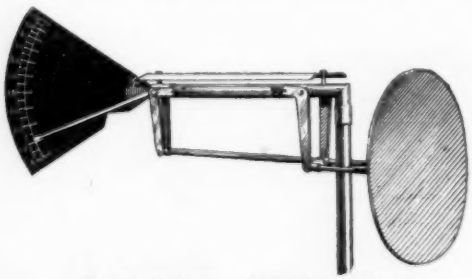
The water cooler shown in this illustration is claimed to have many excellent features. It cannot absorb odors from the food stored in the refrigerator, is placed in the back of the ice chamber out of the way, and is always kept cold. This latter feature is made possible by inclining the ice rack so that the ice will always be against it, no matter how small the supply is.



The cooler consists of a seamless tube 4½ in. in diameter, enameled inside and out. It holds from one to two gallons of water, and its opening is on the outside of the refrigerator.

REGISTERING THE WIND VELOCITY

The ingenious and practical device shown in this illustration is mounted on a post near the aeroplane garages



Simple Indicator of Wind Velocity

of England's great aviation field to automatically determine and post the wind velocity. It swings upon a pivot like an ordinary weather vane, but in place of an arrow it has a slightly concaved disk, and a tail with a scale upon it. The wind, striking the disk, exerts pressure which causes a hand to swing up and down the side of the tail. In the illustration the hand points midway between 15 and 20, thus showing that the velocity of the wind is 17½ miles an hour. The tail not only provides a surface for the scale, but keeps the pressure disk facing the wind as well. The disk is made just the right size to correctly register the velocity of the wind striking it.

SHOES FOR A "STILL HUNT"

In certain kinds of game hunting a noiseless tread is almost an absolute necessity, if the hunter is to return successful. Such a shoe as here illustrated, although it can be worn over rough surfaces without injuring or hurting the feet, is as silent as an Indian moccasin, and the shape of the bottom is very much the same. Stillness and strength combined is obtained by a double thickness, the lower one forming the cushion.

WELL-DRILLING CAUSES MINE PANIC

The miners working in the lower depths of a mine at Shelburn, Indiana, were recently thrown into a panic by a mysterious pounding that came from over their heads, and frantically bolted for the mine opening about half a mile distant. After they were hoisted to the surface, an investigation revealed the fact that the pounding sound was made by a drill used in sinking a well.

The telephone plays an important factor in the fight against frost in the fruit country of the west. The growers of Box Elder county, Utah, have installed phones for the purpose of calling out the help when a sudden frost makes necessary the tending of fire-pots.

HOW TO MAKE A DINING ELECTRIC SHADE

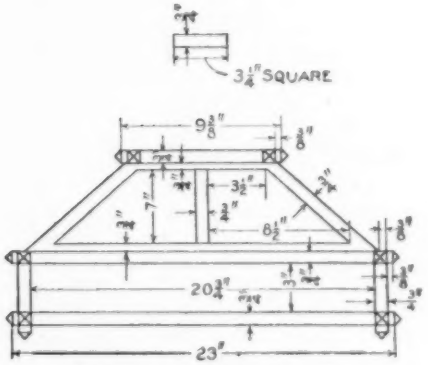
The dining shade shown is constructed of wood and glass. There will be needed the following:

8	pieces,	¾	by	¾	by	24	in., S-4-S, Oak.
4	pieces,	¾	by	¾	by	4	in., S-4-S, Oak.
4	pieces,	¾	by	¾	by	10½	in., S-4-S, Oak.
4	pieces,	⅛	by	¾	by	23	in., S-4-S, Oak.
8	pieces,	⅛	by	¾	by	10	in., S-4-S, Oak.
4	pieces,	⅛	by	¾	by	9	in., S-4-S, Oak.
1	piece,	¾	by	8	by	8	in., S-4-S, Oak.

Begin work by shaping the ends of the longest pieces as shown in the drawing. All the angles are 45 deg. Next lay out the cross-lap joints at the corners so that two sets of horizontal frames shall be formed 23 by 23 in. Cut four pieces to a length of 3 in. each. Also shape up the "false" extensions of these pieces which are to be fastened below the lower frame at the corners. Since these are to be cut from the pieces just specified, the easiest way is to shape the end of each to the required angle and then crosscut. Rabbet these pieces sufficient to allow the art glass to set in on the back sides and be fastened—about ¼ in. will do—and put them together with glue and brads.

Now make the top square in a similar manner, except the rabbets. In this top square is to be fitted the ¾-in. board which is to hold the lights and to which the chains are to be fastened.

The sloping sides are next to be made. The sides are to be built up separately, the corners being lapped and glued after rabbeting the under arrises sufficient to let the glass in. The four sides are mitered together at their edges and reinforced by covering the joint with copper.



Details of Shade Construction

These sides are next mitered to the top and bottom frames and made fast on the under sides with copper strips, glue being used on the edges of the wood.

Electric Shade Complete

The shade shown had a mottled glass in which greens predominated. The sizes and shapes of these pieces of glass would better be determined after the woodwork is finished.

One manner of fastening the chains is clearly shown in the photograph. Such a combination will call for an extra piece of oak, ¾ by 3¼ by 3¼ in. finished stock.

A good finish for this shade is obtained as follows: Put on a coat of silver gray water stain. When this has dried, sand lightly with No. 00 sandpaper and apply a coat of golden oak oil stain. Allow this to dry after wiping the surplus off with a cloth. Put on a coat of black paste filler and allow to harden over night. When dry, sand lightly and put on a coat of very thin shellac. Sand this lightly when hard and put on a coat of wax. This is a very dark finish relieved by highlights of lighter brown and is known as Antwerp oak.

WHIPPING POST CONVERTED INTO ROAD SIGN

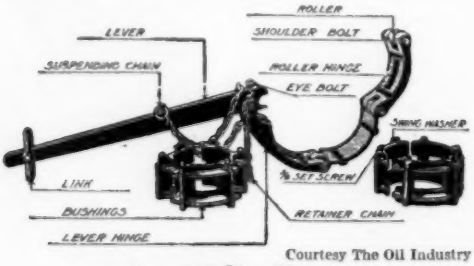
An ancient whipping post that has long remained in position in one of the squares of London-Massey, Essex,

Humane Use for Whipping Post

England, as a relic of more barbarous days, has at last been found a modern task to perform without detracting from it as a thing of local history. Upon its wooden cross-piece have been painted the distances to nearby communities, thus converting it into a road sign.

NEW DESIGN OF PIPE WRENCH

The new pipe wrench shown in this illustration was specially designed for use in oil fields, and is claimed to do



Courtesy The Oil Industry

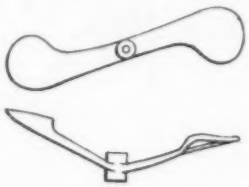
Improved Pipe Wrench

away with most of the troubles hitherto experienced in setting up such pipe. It is clamped to the pipe in somewhat the same manner as the familiar casing jacket, but has a release attachment that prevents the tongs from sticking and allows them to release their grip on the backward stroke of the engine.

Neither teeth nor dies are used, which prevents the scarring up of the casing or its crushing. The drawing shows the wrench in detail.

CURIOUS TREATMENT OF MOTORBOATS

No sooner is an English or French built motorboat or engine equipment received in a town in West Siberia, according to a correspondent writing from that part of the world, than the owner sets to work to remove the beautifully finished and balanced bronze propeller. Then he has a two or three-bladed propeller hacked out of iron or steel plate varying in thickness from 1/8 in. to 3/16 in., and places it on the shaft. As a result the motors slow down considerably in speed, but the boats go faster than with the scientific propeller, in spite of the fact that the crude substitute is all corners and irregularities.



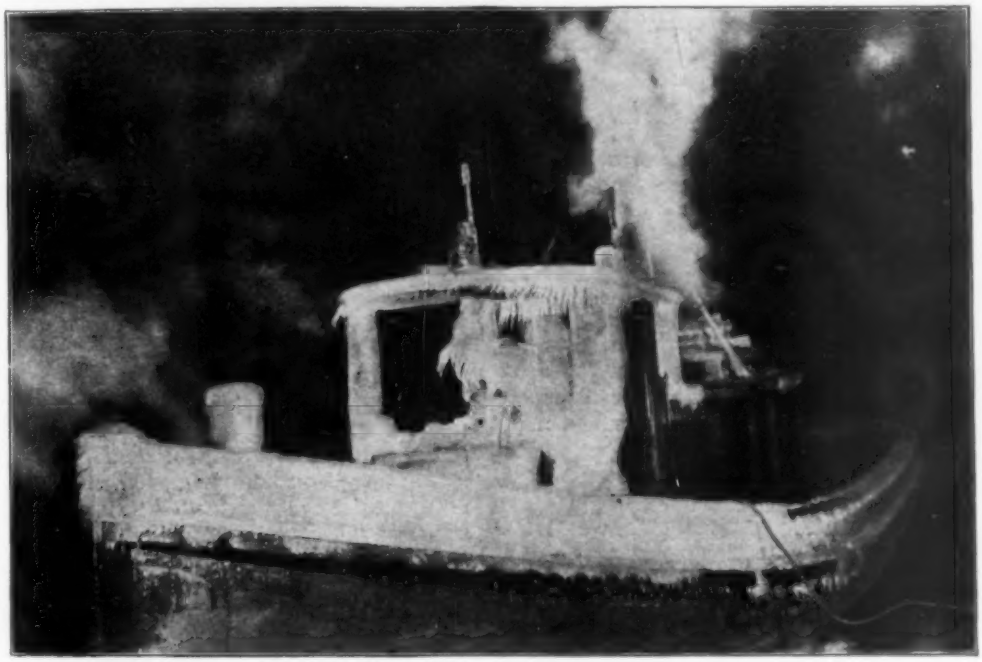
Some idea of the types of propellers that replace those sent is obtainable from the two drawings accompanying this article.

$2,500 AUTOMOBILE SOLD FOR $10

A Westwood, N. Y., man probably broke all records for lowering the price of automobiles when he sold his $2,500 car for $10. A. S. Collington was making a trip through New Jersey when at Belleville his machine tried to climb a tree and was put out of commission. He needed money to return home and sold the remains for $10 to a farmer who said he thought he could use some of the machinery around his barn.

TUG COVERED WITH ICE ON LAKE ERIE TRIP

Seekers for the North Pole and inhabitants of the Arctic regions are not the only ones who consider battles with ice among their greatest problems. Sailors of the Great Lakes toward the end of the navigation season find winter's wind and cold their chief foes. The photograph is a flashlight of the tug "Alva B.," taken in Cleveland harbor on her return from a cruise of 250 miles in Lake Erie in a vain search for 13 men who had put off from the burning steamer "Clarion" in the great storm of the early winter. So loaded was the little craft with ice and frost that she resembled a phantom ship as she worked her way into the harbor.



After a Battle with the Icy Waves

The cruise of the tug "Alva B." was one of the most thrilling of the season. For 250 miles she scoured the lake in the hope that some of the men who had trusted their lives to water rather than fire might have endured the icy waves and stinging winds. Their search was in vain. Ice 6 in. thick and more covered the tug at every point where water was thrown up on her. The rudder froze fast and a member of the crew had to work his way along the slippery deck to chop it free. Ice fastened the hatches and cut the men off from their quarters, forcing them to huddle for hours in the pilot house in the biting cold or about the boilers where there was a little warmth.

VALUE OF WOODLOTS

The few acres of wooded land every farm should boast of are becoming more and more valuable year by year. In Michigan, for instance, which was once so heavily timbered, the farmers are beginning to consider trees as a crop. Underbrush is no longer cut down in the timber patches if the farmer realizes the destruction he is causing. One farmer near Detroit, it is said, paid $500 to have his woodlot underbrushed, thinking it the right thing, and then paid $2,000 to undo the mischief by setting out underbrush in the same places.

COMBINATION CHIMNEY AND WATER TOWER

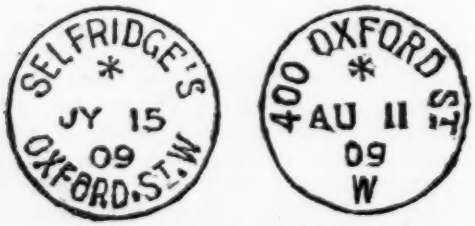
Courtesy Cement Age

An interesting and artistic combination of chimney and water tower is shown in this illustration. It was erected at Anderney, France, and the chimney proper is of specially constructed concrete blocks, while the two water reservoirs are of poured concrete. The upper reservoir has a capacity of about 25,000 gallons, while the lower one holds 6,000 gallons.

The height of the chimney is 180 ft., and the placing of reservoirs around it in which to contain the water required at the plant saves the cost of erecting a water-tower standard.

A POST-MARK THAT ADVERTISED

When Messrs. Selfridge & Co., the American proprietors of the only department store of the American kind in London, succeeded in getting the British postoffice department to establish a postal station in the store, English merchants did not realize the advertising Selfridge was to get. But when the



Original Postmark and Its Substitute

letters mailed there went out stamped with the post-mark shown by the first of these drawings, protest was immediate. The question was brought up in the House of Commons, and the Postmaster-General removed "Selfridge's" from the post-mark and had "400 Oxford St." put in its place, as is shown in the second drawing.

The location of the postal station is, of course, necessary, but the street number now provides this as well as the name of the store formerly did.

CRUDE WIRELESS PICKS UP DISTANT MESSAGES

One night recently, George L. Wilson, of Haddonfield, N. J., hooked up his wireless outfit, comprising nothing more than a tuning coil, detector and condenser, with a loop of the Pennsylvania railroad wire from Haddonfield to Medford, a distance of 12 miles. This wire, which was No. 12 galvanized, thus became the aerial of the outfit, and the ground was the regular telegraph ground through the switchboard, yet Wilson unexpectedly picked up two aerograms from Cape Hatteras, a distance of several hundred miles.

This accomplishment, with an aerial composed of 12 miles of single wire, most of which was going to waste, and his scant equipment, is considered an extraordinary wireless "freak." His receivers were head phones.

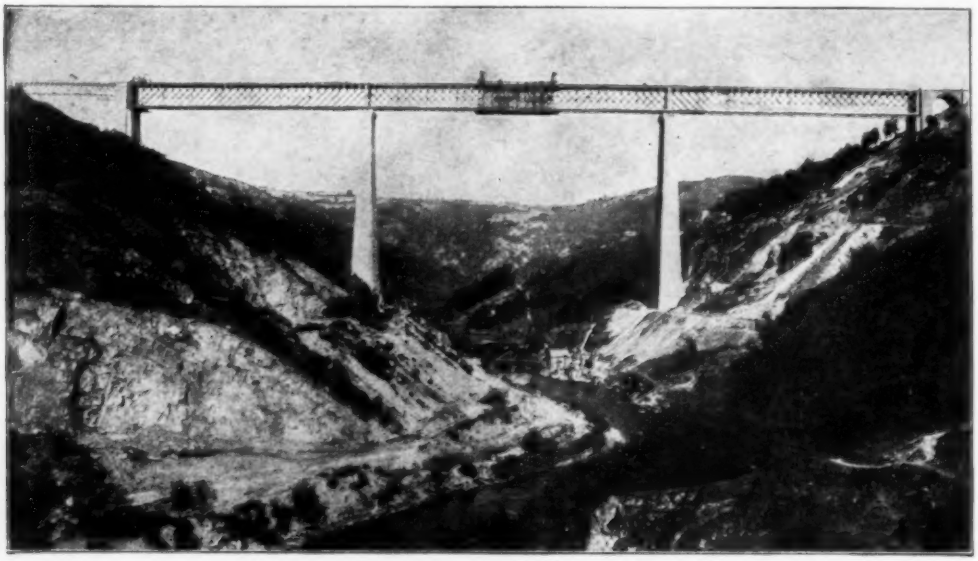
MODERN FRENCH RAILROAD BRIDGE

This great railroad viaduct over the Sioule river in France is considered the greatest bridge of its kind in that country, and one of the most notable bridge-building feats in the world. Its total length is about 1 500 ft., the railroad tracks are 450 ft. above the normal level of the river, and the central span is 465 ft. long. The curious chimney-like piers are 300 ft. in height.

The illustrations show the method of construction, the traveling cages by which the framework was slowly extended being visible in both. In one illustration is seen the false-work piers and supports utilized to support the

How the Bridge was Constructed

inner span on one side until it reached the huge supporting pier. Upon the face of the hill is seen the railway used to lift and lower material out of the Sioule valley. The cost of the bridge was about $800,000.



French Railroad Bridge Practically Completed

A NEW METAL IN AMERICA

Cadmium, a metal that melts in a low temperature, and, like bismuth, lowers the melting of alloys in which it is used, was derived largely from Silesia until two years ago, but now a considerable amount of it is produced in the United States, so much, in fact, that the annual import to this country has now dropped from $10,500 to $2,300.

The chief source of cadmium is zinc ore, although small quantities of this rare metal are contained in some lead ores. The zinc ore of the Joplin district contains as high a percentage of cadmium as the zinc ores of Silesia. Unlike bismuth, which forms brittle alloys, the cadmium alloys are often malleable. Several of them liquefy at temperatures considerably below that of boiling water. One instance of this is a "trick" teaspoon, which melts in a cup of tea, to the great astonishment of the drinker.

A cadmium alloy is also used in the manufacture of automatic fire extinguishers, in which water under pressure is released in a jet or spray by the melting of cadmium under the heat of the fire.

HOME-MADE BABY INCUBATOR

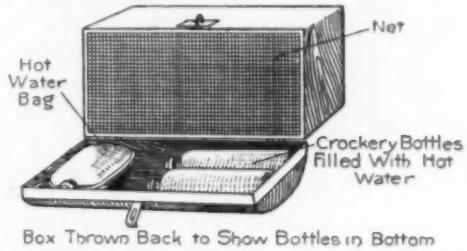
A home-made infant incubator did as much for a Cleveland, Ohio, baby as could be accomplished by the most ornate and scientifically constructed incubator in the land.

Originally, it was a rough tool box, but when physicians told Rudolph Matula, an iron moulder of Cleveland, that his baby would not live because the Ohio city could not immediately provide it with a baby incubator, the box became the much needed article. Matula first turned the box on its side, with the round, trunk-like cover open, and over the opening of the box constructed a false bottom of wire, taken from the door screen. In the rounded hollow furnished by the cover he placed the hot-water bottle and two earthen bottles that had been used for ketchup. Then he lined the box with cotton batting and quilting, and cut a hole in what was originally the bottom

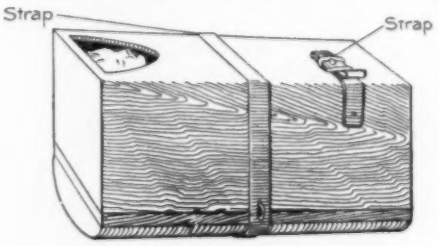
of the box, so that the baby's face would be exposed to the open air. In the water bag, which lay under the baby's pillow, and in the earthen bottles hot water was placed as often as required, and the baby above this source of warmth grew steadily from its 10 inches of length and 4 pounds of weight into a normally healthy condition.

Just how this curious incubator was made is shown in one illustration, while the other shows its appearance in use. When the baby fretted, the rounded bottom of what had been the cover of the tool box provided a rocker on which the mother gently swayed the incubator back and forth. All that was required to get at the bottles and bag for refilling with hot water was to undo the center strap and lift the incubator a few inches.

Some Cleveland physicians became so interested in the remarkable incu-



Box Thrown Back to Show Bottles in Bottom



The Box in Position

Baby Incubator Made of Tool Box

bator that diagrams were made to exhibit before medical societies.

CURIOUS CAPER OF A CYCLONE

Cyclones have long ceased to startle by the freakishness of their behavior, and residents of the western states consider that almost anything is possible

Cyclonic Magic

for a real twister, yet the unique magic-trick performance this photograph accuses a cyclone of perpetrating at Cambridge Springs, Pennsylvania, is unusually subtle.

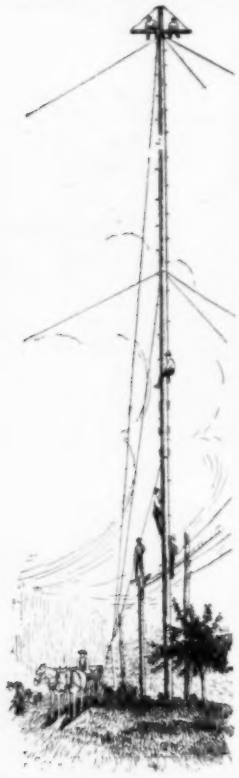
The photograph shows part of the curtain outside and the other part inside the window. The force of the cyclone or the air vacuum it created at just this point pulled the curtain out between the pane of glass and the sash without breaking the pane, and then the glass sprung back to its original position and left the curtain as shown.

MIRAGE PRODUCED IN LABORATORY

A perfect miniature mirage was produced by Dr. Robert Wood, professor of experimental physics in Johns Hopkins university, to show in all its vividness how the thirsty traveler in the desert is deceived by a phantom lake.

The desert was a sheet-iron plate about 15 ft. in length, covered with sand. Under the plate was a series of gas burners, to heat the sand as in a desert. A mirror reflected the sun upon a white sheet of paper at one end of the miniature desert, the paper serving as a clear skyline. When the miniature desert became fairly hot, a clear pool of water seemed to rest just a little way in front of the piles of sand.

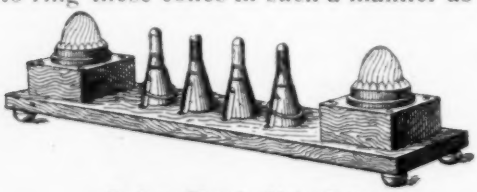
TELEPHONE POLE 118 FT. TALL



This telephone pole, which is one of a pair rising from the banks of the Ohio river at and across the river from Gallipolis, Ohio, is the tallest pole in that part of the country, and one of the tallest in the world. Consisting of two chestnut sticks spliced together, it rises from the West Virginia shore to a height of 118 ft., while its mate on the Ohio side is 116 ft. tall. The diameter of the butts of the poles is about 2 ft. 6 in., and the tops are 8 in. across. The splice in each pole extends 12 ft.

AN ELECTRIC LIGHT GAME

A new and ingenious French electric light game is shown in this illustration. It consists of a board with an electric lamp at each end, and four cones in the middle, the latter being provided at their bases with opposed electric contacts. The purpose of the players is to ring these cones in such a manner as



Curious Electric Light Game

to obtain a winning color illumination, red or green. The number of points scored is determined by adding up the number of rings placed. The rings are tossed over the cones, and the difficulty of the games lies in the fact that after one cone is ringed it becomes necessary to ring, not the neighboring one, but the one following, in order to make the color come out. Should a neighboring cone be ringed, the game stands as at the start, and the player must start all over again.

NICKEL-IN-THE-SLOT POOL TABLES NOW

A nickel-in-the-slot pool table is the latest addition to coin devices. The

pocketed balls all roll into a receptacle at one end of the table. When the game is finished, all the balls put in the pockets and gathered in the box at the end, a nickel must be inserted before the receptacle can be opened and the balls secured.

COMBINATION CONCRETE AND TIMBER PILE

A pile, the lower end of which is timber and the upper concrete, has been devised for use in soil where the ground water level is below the depth to which it is necessary to carry the building footings. The top of the timber pile is driven at least 3 ft. below the ground water line and the concrete pile is formed on top of it to reach to the building footings, the idea being to keep the wood entirely beneath the water so that its decay will be prevented by continuous saturation. The concrete pile above the wood extends through the portion of the soil subjected only to alternate wetting and drying, which injures timber, but does not affect concrete.

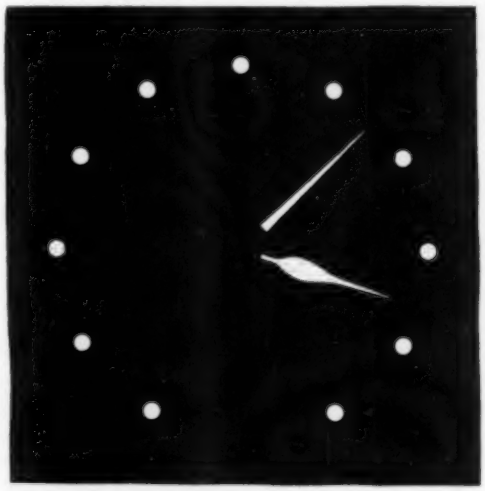
The concrete pile is formed on top of the timber pile by means of a tube, forced into the hole made by sinking the wooden pile.

STEAMSHIP BUILT IN 64 DAYS

The passenger and cargo steamer "Salvador," built to inaugurate a new steamship service between Acejutta, Salvador, and Salina Cruz, was completed by an English concern in the remarkably short period of 64 working days from the time of signing the contract. This is extraordinary, considering that the ship is a first-class passenger vessel, 225 ft. long, with a 33½-ft. beam.

THE RADIUM WATCH

A watch is being marketed in England, the dial of which appears in the dark as shown in the illustration. In the light, the face of the watch looks like that of any ordinary timepiece, and the illumination is gained by putting a composition obtained from pitchblende in grooves in the hands, and in dot-like depressions opposite the hours. The composition contains sufficient radium to cause a bluish-green glow when placed in the dark. The amount of radium in the pitchblende is too minute to be even measured, consequently the watch sells for about $5.

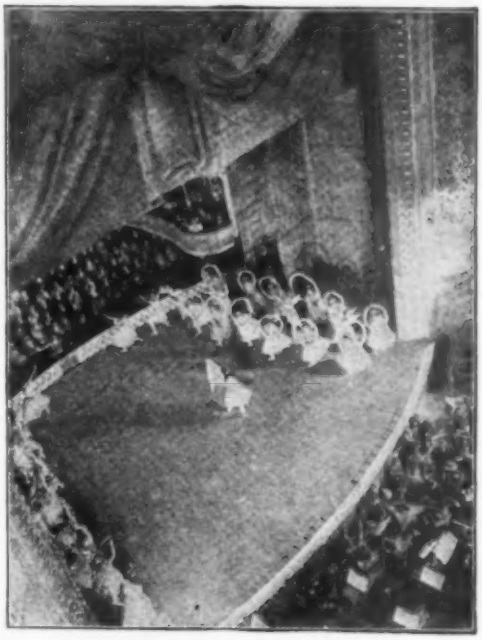


Pitchblende Affords Illumination

The illustration is a photograph, taken by a 2-hours' exposure in a dark room.

A THEATER ON THE STAGE

In the production of "La Petite Caporale" at the Chatelet theater, London, the performers dance for two audiences, one being in the body of the theater and the other in a reproduction of the body of a theater at the back of the stage. The stage setting is a representation of the Gaite theater in 1800, and in the tiers of boxes and the pit at the back of the stage are seated 550 "supers"—men and women hired at a small consideration to view the performance. Comparison of the real and the stage audience would not show much difference, but there is a difference and a very interesting one, as the spectators in the representation of the Gaite theater are paid for assenting to watch the dancers, while the real audience pays for the privilege.

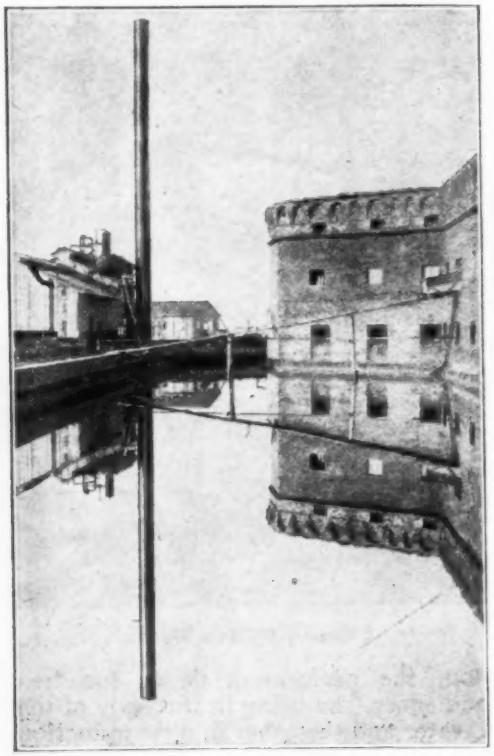


A Theater Within a Theater

The city of Wallsee, on the Danube in lower Austria, once famous and wealthy because of its millstone industry, has just seen its glory completely fade away through the closing of its last millstone concern.

CONFUSING REFLECTION PHOTOGRAPH

This photograph of a Florida manufacturing plant, taken on a day ideal



Which Is the Reflection?

for reflections, is so excellent that it is difficult to tell which is the building itself and which the reflection. The illustration is in reality reproduced upside down, the upper part having been the reflection on the negative.

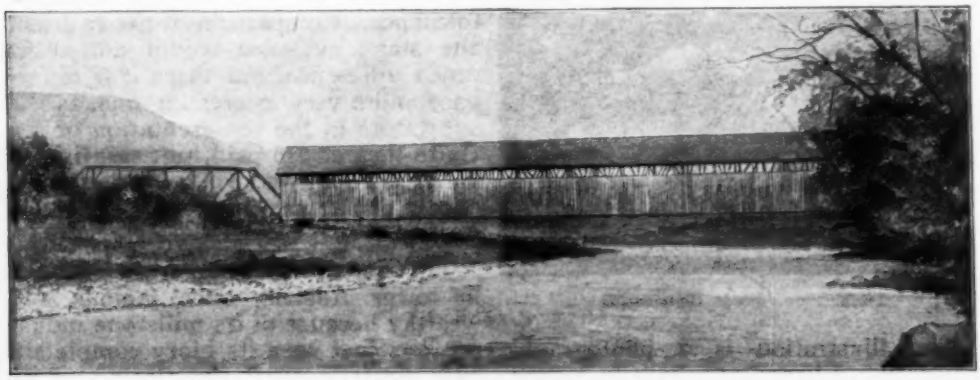
A WOMAN FLEA-CATCHER

There is a young woman in Pasadena, Cal., who makes a profession of relieving Angora cats of a superfluity of fleas. Twice a week she makes her round of calls, and gives each stately tabby a thorough inspection. Her profession is not crowded, consequently she finds it very remunerative, especially as Pasadena has many such cats, and the cats, if not carefully watched, have many fleas.

LONGEST SINGLE-SPAN WOODEN BRIDGE

This old covered bridge is said to be the longest single-span wooden bridge in the world. It has a length of 231 ft., divided into two wide driveways. It crosses the tail-race of a mill at Blenheim, in Schoharie county, New York, and was constructed in 1855 at a cost of $6,000. Just before the last trestle was knocked from under it the boss carpenter took his place in the middle, remarking: "If the bridge goes down I never want to see the sun rise again." As near as could be measured the structure did not settle more than a quarter of an inch.

The iron structural work of the approach replaced a wooden approach about 16 years ago.



Said to be Longest Wooden-Span Bridge

HEAT

Part II—How Low Temperatures Are Produced

By J. Gordon Ogden, Ph. D., Professor of Physics, Fifth Ave. High School, Pittsburgh

The principle underlying the production of low temperatures is very simple and easily understood. It depends upon the warfare that constantly exists between heat vibrations, and the cohesive force that holds matter together. If matter be heated, the cohesion between the particles is lessened, and if sufficient heat be applied, the matter changes from the solid to the liquid form, and then to the gaseous—a triumph of heat vibration over its antagonist, cohesion. Conversely, if we drive matter into closer relationship between its component particles, in other words if we compress it, the heat vibrations are driven out, and cohesion is the victor.

Expansion absorbs heat. Compression sets it free. Everyone is familiar with the fact that when we squeeze air into a smaller space, as for example when we pump it into a bicycle tire, the pump soon becomes quite hot. Whence the heat? It is the result of forcing the particles of air closer together, thus setting free the energy which had kept them farther apart. Likewise, every observer knows that an enormous amount of heat must be given to water at the boiling point to induce it to become steam; and further, that the temperature of the steam given off, if not confined within a boiler or other container, is exactly the same as the temperature of the boiling water. Steam is simply expanded water, and the heat energy essential to its production does not change its temperature. What then, becomes of this heat energy? The answer is easy. The heat is transformed from energy of motion to energy of position and is given to the molecules of water as the admission price to the realms of steam. It becomes that which serves to give the molecules of steam the freedom of motion and consequent increased volume which constitutes the difference between a liquid and a vapor. (Fig. 1.) Since this heat is lost to measurement, but reappears upon the condensation of the steam, the name, "latent heat," was given to it by the early philosophers.

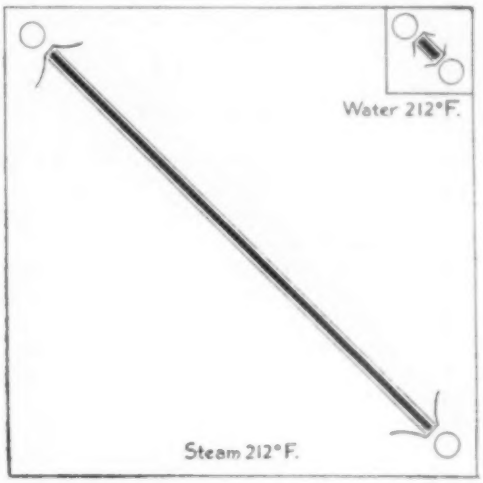


Fig. 1—Water and Steam at 212°F. The heavy bars represent diagrammatically the heat energy which by driving the molecules farther apart causes the water to change its condition, but not its temperature.

A cubic inch of water absorbs a comparatively large amount of heat when transformed into steam. The steam, however, will occupy the space of a cubic foot, over 1,700 times the original bulk of water. Should this cubic foot of steam be squeezed into one cubic inch of space, it would again assume the liquid form, and the heat energy which permitted it to become a vapor, would become sensible and available for other work. In changing matter from one condition to another, there is still another element that must be taken into account—pressure. If a cubic inch of water be confined within a strong steel box holding exactly one cubic inch, and heat be applied, the water cannot become steam, but continues to grow hotter and hotter until it in all probability becomes white hot. This element of pressure is a very important factor in the various changes of condi-

tion, as we shall see later when we come to consider the liquefaction of gases.

In a mixture of water and ice the temperature of each is the same, viz.: 32° F. What, then, is the difference

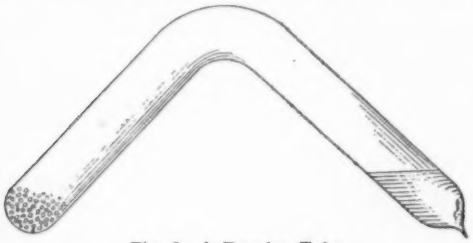


Fig. 2—A Faraday Tube

between them? Simply this: the water contains heat vibrations sufficient to lessen the cohesion between its molecules, and they are permitted to move freely about through the liquid. It will be remembered that the difference between solids, liquids, and gases, is one of molecular freedom. It is necessary to heat ice to melt it. And yet the temperatures of freezing water and melting ice are precisely the same. Here we have exactly the same problem as in the case of the boiling water and steam. And as in the latter case, the heat vibrations simply give molecular freedom, but not higher temperature. When these heat vibrations are taken from water, ice is the result. Freezing is nothing more nor less than a heating process. In fact this principle is taken advantage of in a practical way by farmers who protect their potatoes in cold cellars by filling tubs with water and placing them adjacent to the potato bins. The enormous amount of heat energy set free by the freezing water serves to protect the potatoes from damage.

All of this is simple and easily understood, but it took the world many thousands of years to learn the lesson. Up until about a century ago, the world had a very hazy conception as to the vibratory nature of heat, and rather considered it as a material thing, a fluid which permeated matter like water does a sponge. Aristotle, in the fourth century, B. C., taught that heat is one of the four elements that enter into the composition of the universe, the other three being, water, air and earth. And this idea clung persistently in some form or other to the men who made science their pursuit, through more than a score of centuries. In 1799, Sir Humphrey Davy in a brilliant essay on Heat, heartened the few devotees of science who believed in the "motion" theory of heat, and thereby stimulated research. In 1806, Northmore succeeded in liquefying chlorine gas by compressing it to one-tenth its volume. This remarkable experiment set the world to thinking. In 1823, Faraday, the book-binder's apprentice, liquefied chlorine by heating the hydrate of that gas in a bent tube (Fig. 2), one end of which was closed, and the other end sealed after the introduction of the hydrate. The sealed end was placed in a freezing mixture, and the other end heated. Chlorine was given off in large quantities but found itself hampered by the narrow confines of the tube and was crushed by its own pressure into a liquid. With this simple device, a bent tube, Faraday succeeded in liquefying sulphur-dioxide (the gas which is given off when ordinary sulphur is burned in air), carbonic acid gas, nitrous oxide, cyanogen, hydrochloric acid, and ammonia.

A gas may be liquefied not only by compression, but also by extreme cold. In most cases both are required. Heat ever struggles to maintain an equilibrium, and two bodies of different temperatures placed in close contact will become equal in temperature. In Fig. 3 is shown a device whereby many gases may be liquefied on the principle of equalization of temperature. Flask A contains copper and nitric acid; B is a wash bottle containing water; C is a drying tube containing calcium chloride, while D contains a freezing mixture of pounded ice and ammonia chloride. The gas, sulphur-oxide, will condense into a liquid in D, as the freezing mixture warms itself at the expense of the heat vibrations of the gas which is consequently reduced to a liquid.

Numerous other gases were liquefied after Faraday's brilliant work with chlorine, and it was confidently predicted that all gases would finally yield

the puckered lips, immediately expands ware jars in a draught of

to the same method as Faraday had used. Six gases, however, obstinately refused to liquefy, and were known as "permanent gases." Even Clerk Maxwell, one of the greatest mathematicians and physicists the world has ever known, declared positively that hydrogen, at any rate, could never under any circumstances be liquefied, and undertook to demonstrate this bold statement mathematically. Faraday, however, to

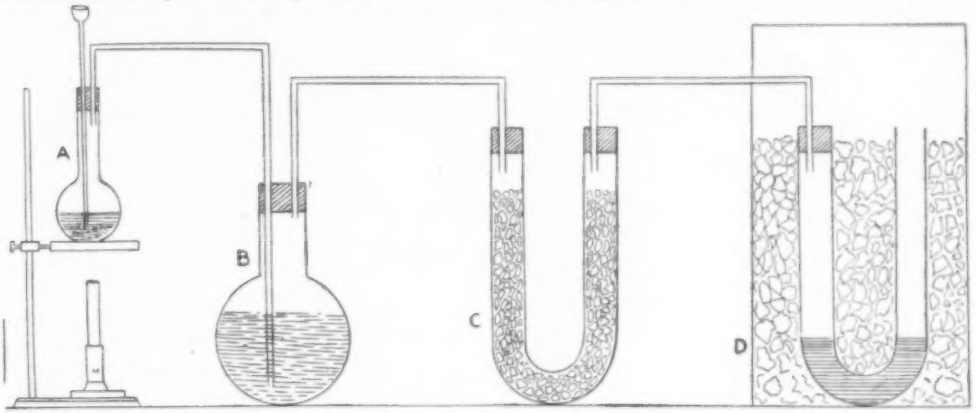


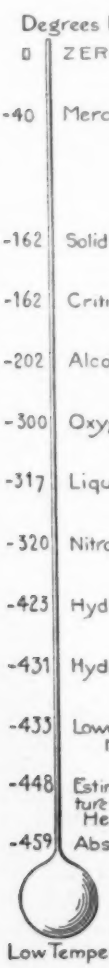
Fig. 3—Apparatus for Liquefaction of Gases by Cold

the end of his days maintained, mathematics or no mathematics, that some day hydrogen would yield. Time has shown that Faraday was right. These six gases were Laughing gas, Marsh gas, Carbonic oxide, Nitrogen, Oxygen, and Hydrogen. Apparatus for applying the enormous pressure of over four tons per square inch was used in the attempt to liquefy these refractory gases, but all in vain. Science baffled, reviewed all it had done, and decided that something besides pressure was needed to solve the problem. Then out from some dim laboratory crept the solution of the problem. And the secret that had halted the eager scientists for so long is simply this: that every gas has what is known as a "critical temperature"; that this critical temperature differs with each gas; and that all the pressure in the universe could not liquefy a gas if it were not first cooled below this critical point.

Then Science buckled on its armor and went after the "Big Six" as they were familiarly known at that time. One by one they were conquered and literally made to run like water. Even hydrogen, as will be described later, gave up the ghost, and now no gas remains that has not been liquefied. Air has been liquefied by the hogshead, and sent hundreds of miles for lecture purposes. Science has never achieved a victory greater than this. How delighted Faraday and Davy would be were they permitted to come back to earth to view the wonderful progress made by science in this their favorite line of research.

The principle involved in the liquefaction of the so-called permanent gases is precisely the same as that indicated in the liquefaction of the other gases before mentioned. It is simply a matter of compression at the proper temperature, and then — expansion. When one breathes out used air from the lungs through the wide open mouth, the breath has the same temperature as the body, 98.6 F., and frequently, on a cold day we warm our fingers by breathing on them. If, however, we blow the breath vigorously from the mouth, the temperature of the breath appears to be much lower than when breathed gently and with open mouth, and is decidedly cooling in its effect. This latter fact is due to the well known principle established by Lord Kelvin, that a compressed gas upon expanding will absorb heat. The breath, compressed by being forced to pass through the small orifice made by

the puckered lips, immediately expands upon being admitted to the outer air, and to do so, must take up heat. This is also the identical principle involved in the manufacture of artificial ice. Ammonia gas is first compressed into a liquid, and then liberated into a network of tubes surrounding large sheet-iron boxes filled with distilled water. The liquid ammonia set free at one end of the pipe system, begins at once to evaporate and by the time it has scampered through the long iron tubes it has become a gas. As we have learned, to change a liquid to a gas, requires heat. This heat is taken from the iron piping, an excellent conductor, which in turn robs the water of its heat, thus freezing it.



Another good example of the same principle is shown in the phenomenon of perspiration. The body, in order to carry on its various chemical and vital changes works at a temperature of 98.6 F. When one over-exercises, the bodily temperature rapidly rises. Immediately the sweat glands, ever on guard, pour forth their water. This water, or sweat, begins to evaporate, and in doing so, takes excess heat from the body, reducing its temperature to normal.

In the East Indies, water quite cold may be readily obtained by placing the ordinary tepid water in porous earthenware jars in a draught of air. The water oozes through the porous walls and passes off as vapor, taking the requisite amount of heat necessary for evaporation from the water within the jar, reducing its temperature considerably.

In 1893, Dewar liquefied air by means of great pressure and a "step-down" cooling process. He used first liquid ammonia or frozen carbonic oxide; then ethylin, whose freezing point is still lower, and so on, successive substances being used, each with a lower point of liquefaction than the preceding substance, until finally air itself was liquefied at a temperature of 317° F. below zero. Dewar produced only a few drops of this precious fluid, and said afterwards that a quart would cost from $2,500 to $3,000. Shortly after Dewar's brilliant achievement, Tripler of New York succeeded in making liquid air by the gallon, and at a comparatively low cost. Tripler used air itself as a medium for cooling the portion of air to be liquefied, thus cutting down the cost of Dewar's method.

The liquefaction of hydrogen by Dewar was indeed a triumph. Hydrogen, of all the gases, is the most refractory. Kelvin's law, before quoted, did not seem to apply to hydrogen, as expansion instead of cooling it, really made it warmer. By a series of exhaustive experiments, it was learned that this action was due to the fact that the hydrogen had not been cooled nor compressed sufficiently before it was allowed to expand. Dewar placed some pure hydrogen under enormous pressure, and surrounded it with intensely cold refrigerating substances, then suddenly opened the stop-cock of the vessel containing the compressed hydrogen. The gas, rushing forth, expanded immediately, and in doing so robbed the remaining gas of sufficient heat to liquefy it, and hydrogen, the last of the "permanent" gases, was conquered.

The liquefaction of hydrogen marks practically the lowest temperature so far attained by man, and the point reached is very near to the Absolute Zero (Fig. 4), where heat vibrations are unknown, and matter itself is supposed to be in a state of absolute rest.

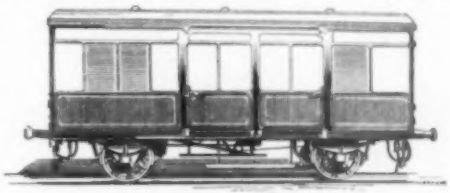
DIRIGIBLE USED FOR DISTRIBUTING ADVERTISING

A dirigible balloon has been put to practical service by an automobile company at Dayton, O. The head of the concern is an airship enthusiast, having frequently made trips in the dirigible. He had a million cards printed advertising the cars his company is putting out, and they are thrown out above the towns in that section of Ohio by the operator of the balloon. Large packages are thrown out at a time, and the fall of several hundred feet serves to distribute them over a great space.

Concessions for two underground electric railways under Buenos Ayres have been granted by the government of Argentina.

TRANSPORTING AUTOS IN INDIA

The automobile trade has become so important in India that the railroads of that country have had to devise special freight cars for their transportation. These cars have double doors at both ends and on both sides, and are 25 ft. long by 8½ ft. wide. The floors of the cars are lower than those of the ordinary freight car, a feature designed to suit the loading requirements.

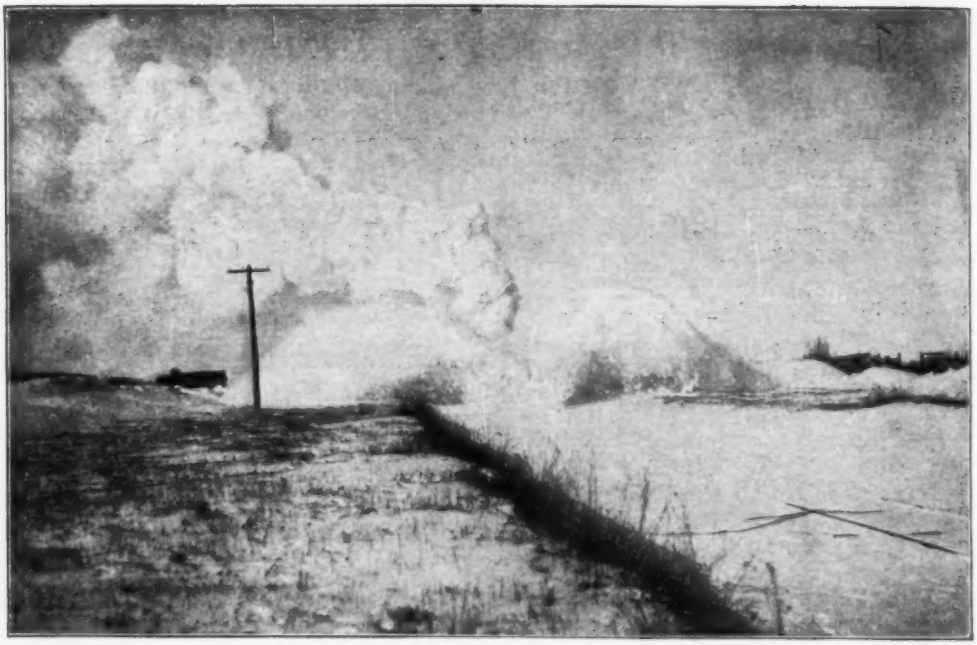


Special Freight Cars for Autos

SNOW PLOWS RAISE SIEGE OF MINNESOTA TOWN

There is nothing very new about a blizzard of the ordinary variety, but the entire population of Tyler, Minn., is ready to swear as a man that the one which recently visited that town was never made in duplicate. It was the

The Main Street the Morning After



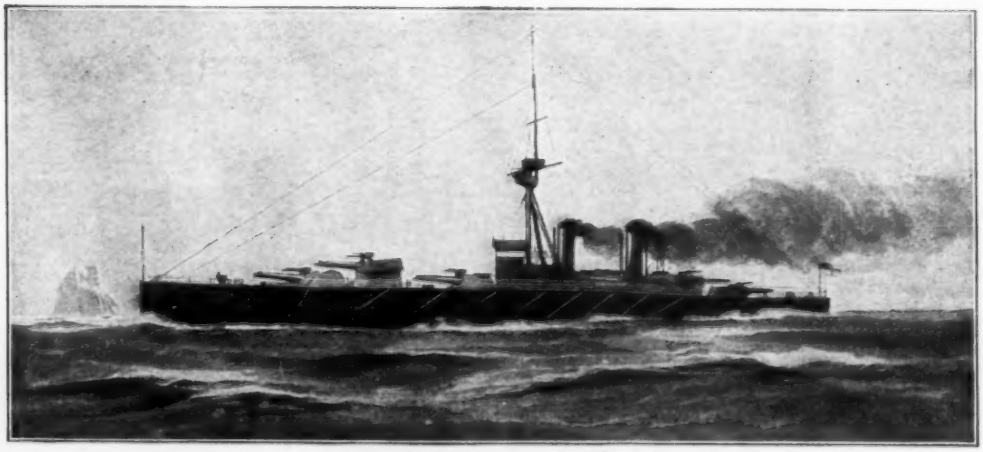
Snow Plow Battling with Drifts

most unwelcome visitor ever entertained in the township.

It howled and raved all night and when morning came the community was snowed in from the world. At some places the drifts had piled 12 ft. high. Half a dozen railroad snow plows were dispatched to fight their way into the town, and presented a picturesque sight as they tore through the great snow banks.

A FUTURE ENGLISH BATTLESHIP

A berth has just been prepared at Portsmouth for the "Orion," which is to be the largest battleship yet authorized by England. The illustration, which is reproduced from a drawing in the Engineer, London, gives some idea of how the great fighting ship will look with her two raised barbettes.



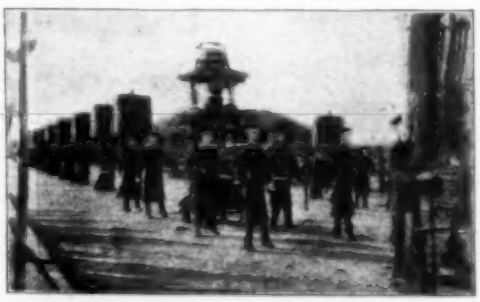
How H. M. S. "Orion" Will Look

The length of the vessel will be about 560 ft., and she will carry ten 12-in. guns in five barbettes, all arranged on the center line. This makes possible the firing of the ten guns on either broadside, and the two raised barbettes allow firing directly ahead or astern of four guns.

Somewhat the same arrangement on two of the American battleships already in commission makes a like concentration of fighting power possible, and the 26,000-ton American warships about to be built will be far more powerful than the "Orion." Consequently, the United States now has the two most powerful sea-fighters in the world, and will still retain this advantage in a couple of years from now, although far behind England in number of "Dreadnoughts."

A SPIRIT RETINUE FOR THE CHINESE EMPRESS

When the late empress of China joined her ancestors and the impressive funeral ceremonies were held, one of the principal features was a procession of 3,000 papier maché figures, made up to represent a royal retinue, consisting of guards, coaches, court officials, and servants. Following the parade of the figures through Pekin, and just before the final ceremonies were held, the entire paper escort was burned in order that there might be fitting accommodations for her Imperial Majesty's spirit on its arrival in the other world. In



Part of the Escort Which Was Burned to Join the Empress in the Spirit World

the happy realms beyond, the 3,000 courtiers and attendants will see that her every wish is fulfilled.

ALASKA'S FIRST SUBMARINE MINER

Many methods are now in use in Alaska to recover gold from water

Courtesy Mining World

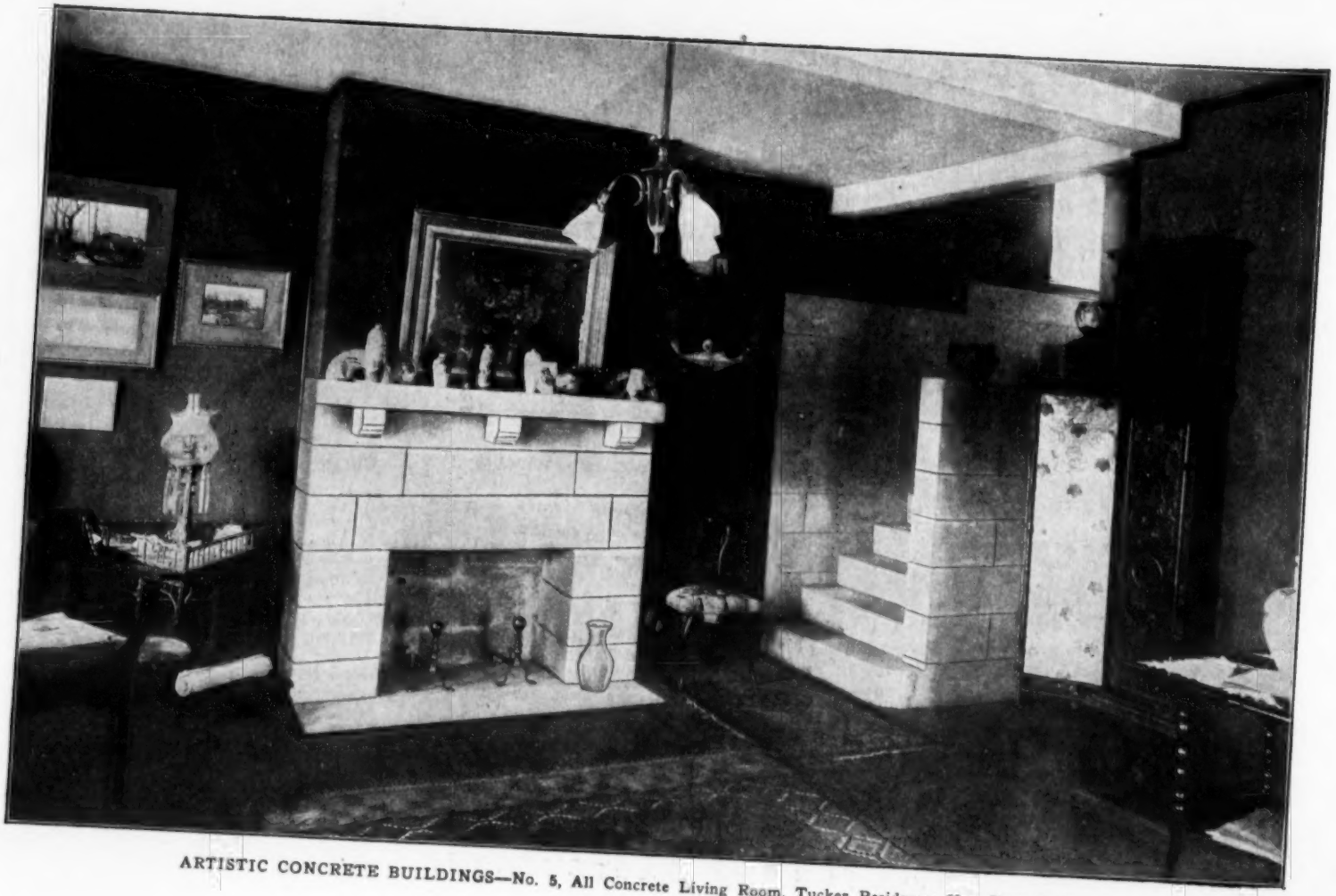
Diving for Pay Gravel

beds, but the first real submarine miner of Alaska was Capt. Fink, a Norwegian, and his method is shown in the illustration. He worked for several years off the coast of Alaska, descending through the ice with a diver's equipment to the bottom of Bering sea. He would remain under water several hours at a time, filling and refilling the bucket lowered to him.

MORE POWERFUL PROPELLERS FOR "MAURETANIA"

New and larger propellers are to be fitted to the "Mauretania" to utilize the reserve of engine power which has not yet been called into play. The propellers she now uses are not considered absolutely perfect, and the builders and engineers anticipate that the change will make her a 30-mile ship, if not even faster.

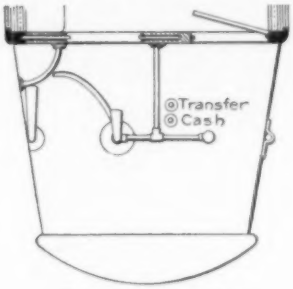
The management of the Italian state railroads is testing the value of Chilean timber for ties.



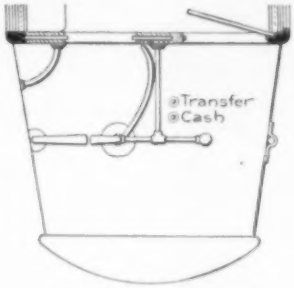
ARTISTIC CONCRETE BUILDINGS—No. 5, All Concrete Living Room, Tucker Residence, New Dorp, S. I.

NEW CHECK GATE FOR COUNTING PASSENGERS

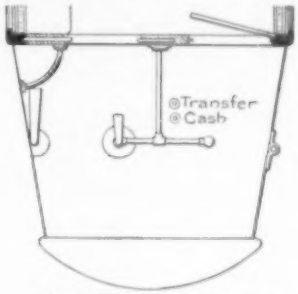
A new check gate for registering passengers that works as well on the platform of a pay-as-you-enter car as at the entrance of stations, a feature which the ordinary turnstile does not possess, has been placed on the market by a New York concern. The illustrations show three positions in the working of the gate as installed on street cars, and a view of a pair of such gates before a station paying booth.



First Position of Gate



Second Position of Gate



Arms Disposed of for Exit

The gate consists of two short horizontal pivoted arms of slightly different lengths, pivoted on top of iron posts set in the platform, and a curved arm forming a secondary barrier mechanically connected to act in unison with the first mentioned arms. The two short arms are about waist high, while the curved arm is in the shape of a bent loop with the top bar at about the same height. When the gate is in position the two short arms are opened inwardly and the curved arm is swung across the passageway, completely closing the entrance. A slight forward push of the entering passenger's body swings the curved arm clear of the passageway, and at the same time causes the two straight arms to swing out behind him, thus closing the passageway after him. The next passenger entering pushes open the two straight arms, which, in opening, cause the curved arm to swing out again and close the passageway.

The room between the short arms and the curved arm is only enough to allow one person to pass through in one movement of the gate. The connecting links between the short arms and the curved arm, which cause them to move simultaneously, are below the platform floor. By removing the curved arm and locking back the short ones the entrance is converted into an exit.

OPENS DOOR BY FOOT PRESSURE

This device, manufactured by an English concern, opens doors by the pressure of a foot and thus does away with the necessity of turning the door-knob with the hand. The advantage of such a device on a door that is used by servants or others when both hands are occupied in carrying is obvious.

The device consists of a small flat bar that is slipped over the spindle of the lock between the plate and the handle, a square hole in the bar making this possible. Another flat bar connects with a movable foot ledge, and by pressing this, the bar is drawn down, the knob is turned, and the door swings open.

A trolley car left the tracks in Nashville, Tenn., and struck a line of telephone poles, laying 60 of them flat before ceasing its activity.

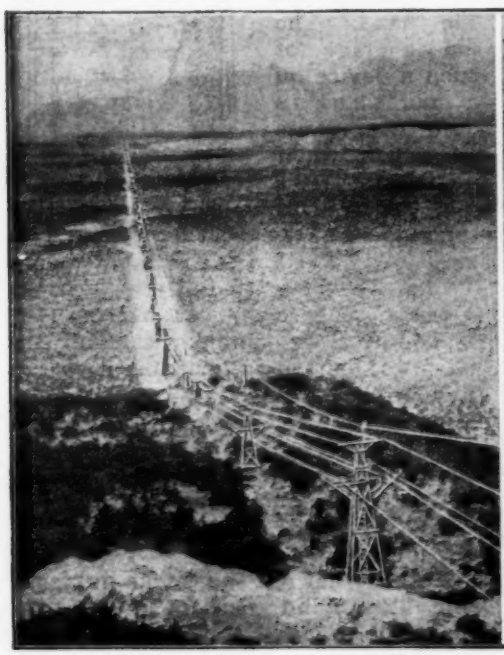
LONGEST AND HIGHEST CABLEWAY IN THE WORLD

Mountain cableways have been in use for many years for transportation to and from mines in Spain where the establishment of ordinary traffic-ways proved impossible, but nothing of the kind in that or other countries compares with the great aerial line now in operation in the Argentine Republic. It traverses a mountain stretch of 24 miles in the region of the Cordillere, in the north of the Republic, where there are enormously rich minerals, which until now have never been mined because of transportation difficulties.

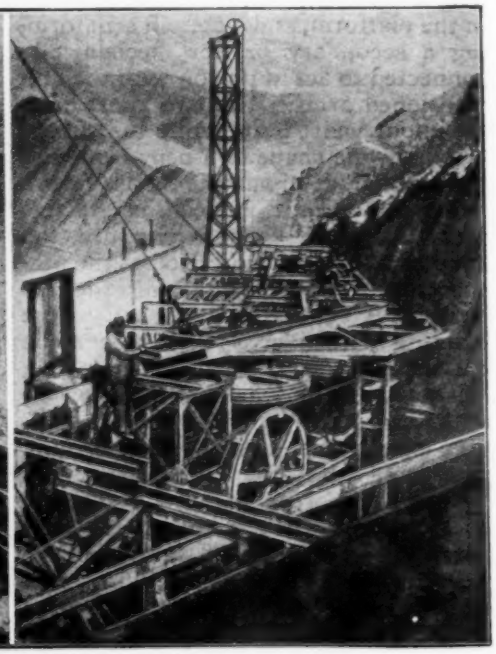
Rails Take Place of Cables in Tunnel

Not only is the cableway extraordinary in its length, but in the height it reaches as well. It starts from Chilecito, which is 3,250 ft. above the sea level, and rises to an altitude of 15,000 ft.

The cableway is of the usual double type for return of the carriers, consisting of fixed cables on which the carriers run and constantly moving cables which draw them, but, owing to the variable inclinations it must traverse, it is divided into eight sections. That is, the traction cables are so divided, while the cables on which



Stretching Across to the Mountains

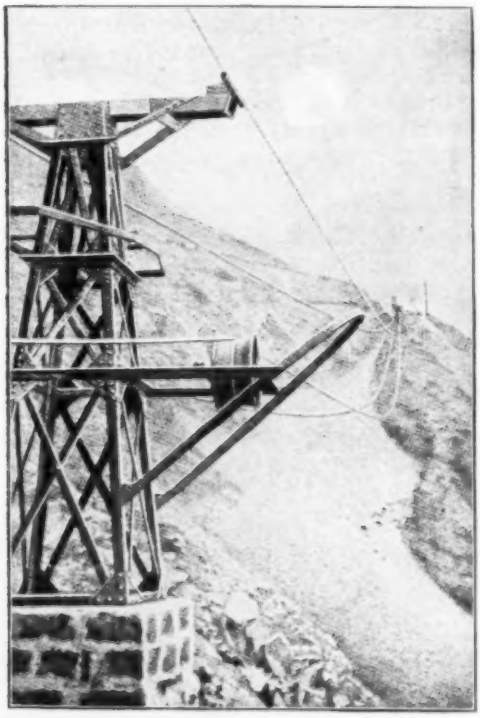


An Intermediate Station

the carriers run form one continuous uninterrupted way. The carriers thus pass through intermediary stations and at each one are detached from the traction cable preceding, and yoked to the following. The carriers are each capable of a load of ore weighing 1,200 lb.

The framework of the station and the cable supports are of iron. At the station crossings and in the one tunnel the cables on which the carriers run are replaced by metal rails. Passengers are transported by carriers provided with four seats. Chests are provided for mail. The capacity of the cableway is 40 tons of mineral an hour.

The illustrations show the cableway at a height of 14,000 ft., one of the intermediate stations, the appearance



One of the Towers

of the tunnel, and other interesting features.

More than 100 sq. in. of rabbit skin was grafted onto the burned flesh of a fire victim in Kansas City.

LOCOMOTIVE REPAIRED WITH BARREL AND COWBELL

While a long freight train was passing through Gold Bar canyon, Wash-

After Fighting a Gale

ington, a small tree, uprooted by a gale, fell across the locomotive, totally demolishing the smokestack and carrying away the bell. Both were necessary parts of the locomotive, consequently the engineer and fireman devised a way to replace them.

Procuring an empty vinegar barrel, they knocked out the heads and then securely wired it over the stack hole. An old, rusty cowbell was strapped to what was left of the bell standard, and in such guise the train proceeded to Tacoma.

MADRID DISCARDING AUTOS

Poor old Dobbin is returning to his own in Spain, and once more the horse-drawn carriage is preponderant on the avenues of Madrid. According to the United States consul at that place, many persons are selling their machines very cheaply to get rid of them, while the carriage and horse trade, on the other hand, is looking up. This is caused by the fact that repairs and separate parts are very expensive owing to the high duties, freight, commissions, etc., the greater number of the machines being of foreign manufacture. The price of gasoline in Spain is double what it is in France.

A HANSOM TAXICAB

The latest type of taxicab to make its appearance in Paris is patterned after the ordinary horse-drawn hansom and embodies many excellent features. Chief among them is the placing of the chauffeur on an elevated seat in the rear, thus giving the passengers in the cab a broad and unobstructed view ahead. The body is provided with a coupé top which may be folded down in front when the weather is pleasant.

The Hansom Taxicab

The illustrations show the new taxicab as it appears with coupé top in position and folded down.

MACHINE WRAPS 100 ORANGES PER MINUTE

The orange-packing plants of the Pacific coast have long employed sizers, weighers, brushes, nailing-machines, etc., all of which work automatically, but until very recently wrapping was done by hand, and still is in the majority of packing houses for this fruit.

A machine has now appeared, however, and has been successfully tested in several large plants, which automatically cuts and prints the wrapping paper, and wraps the orange. Each machine wraps 100 oranges a minute, over a carload every 10 hours, without waste of paper, injury to the fruit, and with perfect precision. Mechanical hands pick up the fruit without bruising the skin and place it on conveyor belts with the stems upward, so that in wrapping the stems are protected by the surplus paper, thus obviating the danger of stem-puncture. The wrappers, already cut and printed by the machine, are automatically fed onto the belt and receive the fruit from the mechanical hands. Then the machine folds the wrappers around the oranges and crimps them over the stems so tightly that the fruit can be rolled over a rough floor without undoing it.

TROLLEY SPARKS IGNITE GASES

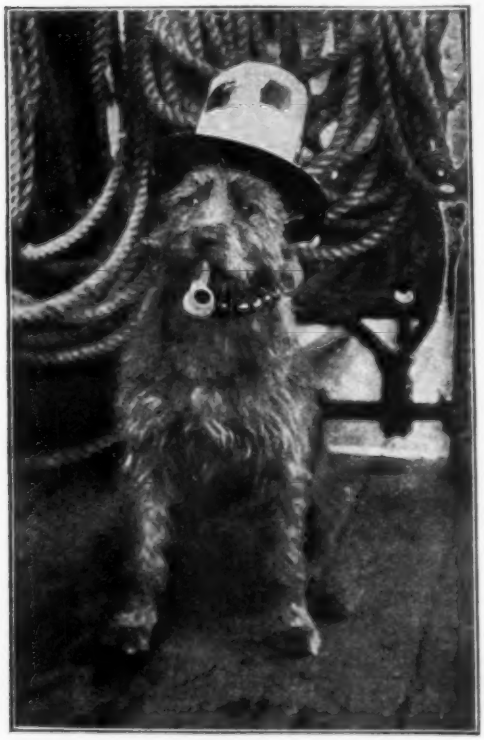
The ignition of inflammable gases in the atmosphere by sparks from trolley wires caused two accidents recently, one in Great Britain and the other in

Same Machine with Coupé Top Down

India. In England a spark ignited some gas which was escaping from the window of a house, and an explosion took place. In Calcutta a native store, where methylated spirits and other inflammables were kept in bottles and casks, was set on fire owing to the fact that a combustible atmosphere was formed by the fumes, being ignited by a spark from the trolley wheel of a passing car.

A DOG THAT LIKES TO SMOKE

"Jack" is the mascot of the bluejackets at the Newport, R. I., naval station, and he holds a high place among the mascots of the United States navy. He is an Irish terrier and for many years sailed around the world on our warships. He is now getting old, however, and is not obliged to do sea duty any more. When things become dull around the Newport station the sailors dress Jack up with an old hat and a pipe, and the dog has a smoke.



"Jack"—He's an Old Salt

Damage Ascribed to Labor Troubles

HUGE CRANE WRECKED BY DYNAMITE

The wrecked crane shown in these illustrations was destroyed by dynamite at the moment of its completion as a result of labor troubles. It was built at a cost of $20,000 for a Cleveland, Ohio, manufacturing concern by a contractor who had been having trouble with the unions, and the dynamiting was the third of a series of such outrages committed at Cleveland within the past year.

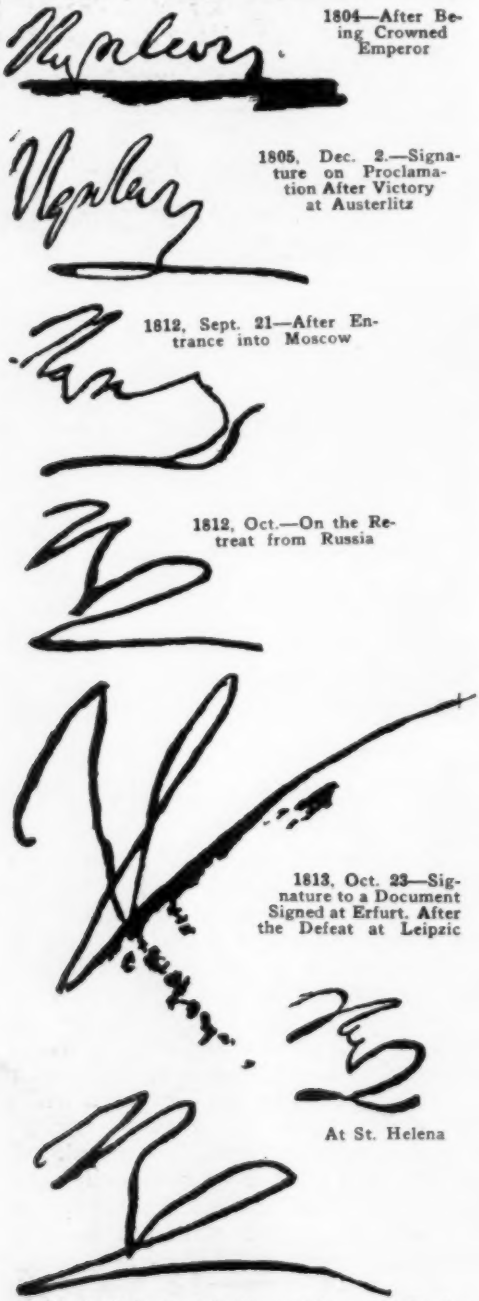
The charge of dynamite was placed at the base of one of the main supports, and the force of the discharge brought the entire structure to the ground.

Automobile coats with turquoise buttons are now the rage in feminine Paris.

EVOLUTION OF NAPOLEON'S SIGNATURE

No instance of the tendency of handwriting to change with the development or moods of the writer is of more interest than that of Napoleon. How victories and defeats, great exaltation and overwhelming depression, and other emotions affected the handwriting of the great general is clearly shown in the accompanying reproduction of his signatures after being crowned Emperor, after the victory of Austerlitz, after entering burning Moscow, on the retreat from Russia, after the defeat at Leipzic, just prior to abdication, and at St. Helena.

All these signatures were made on occasions calling forth widely differing emotions, and they vary as greatly as did the emotions. The difference between the orderly signature written after the victory at Austerlitz and the blotted scrawl after the defeat of Leipzic is very striking. All of his signatures made at times of failure or depression have a downward slant, while that after the victory of Austerlitz slants upward.


1804—After Being Crowned Emperor
1805, Dec. 2.—Signature on Proclamation After Victory at Austerlitz
1812, Sept. 21—After Entrance into Moscow
1812, Oct.—On the Retreat from Russia
1813, Oct. 23—Signature to a Document Signed at Erfurt. After the Defeat at Leipzic
At St. Helena
1814, April 4—Fontainebleau, Prior to Abdication

Napoleon's Many Signatures

GIRL'S EYE TATTOOED

The tattooing of a perfect semblance of an eye on the blind eyeball of a Philadelphia girl was successfully accomplished in one of the surgical colleges of that city by Dr. L. W. Fox. The eyeball was covered with an ugly white blemish, and it was because of the strength of this growth that the delicate tattooing work, an operation performed only a few times by the greatest eye specialists in the world, met with success. India ink and vegetable dyes were used.

FAIR LIFE IN FRANCE

The fairs which are located throughout the year in some district or other of Paris, make up a veritable city of booths and caravans, whose inhabitants pick up their dwellings and places of business about 30 times a year to set them up again in some new location for a week or two.

The life of the performers is a

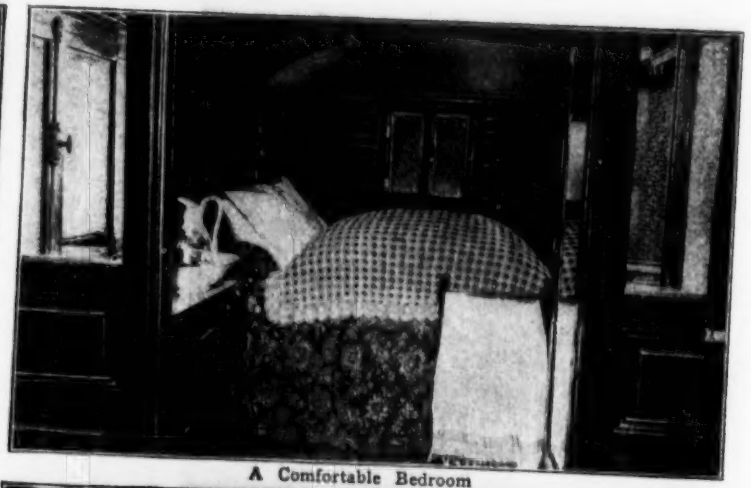
Interior of Itinerant Schoolhouse

nomadic existence, but their itinerant homes are much more comfortable than the tented houses provided for American circus performers, and often represent an investment of 300,000 francs, or about $57,000.

Naturally the proprietor of an undertaking of this caliber is not satisfied with one wagon, but has instead a whole train of vehicles, making up the habitations of himself and his family, his employes, and several freight

A Backyard Discussion

Children Glad When School Hours Are Over



A Comfortable Bedroom

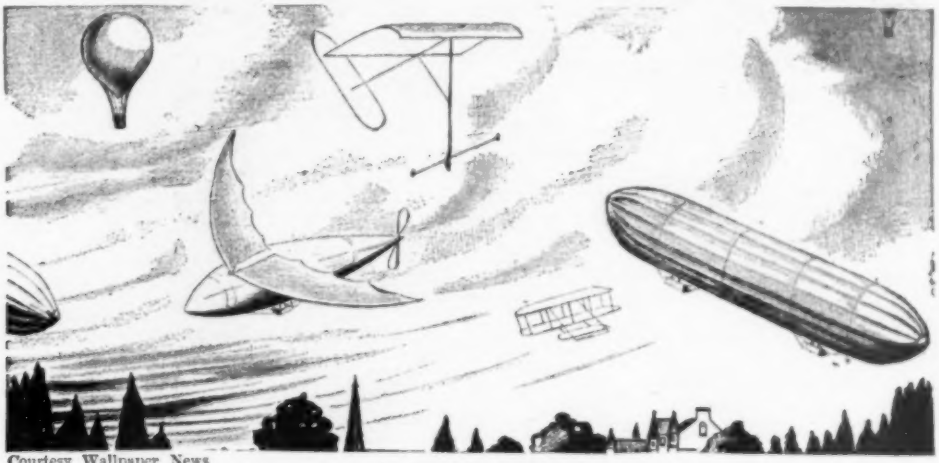
Breakfast and the Morning Paper

Housewife Brushing Off the Piazza

wagons. As everywhere, there are rich and poor, and hence both comparatively luxurious and likewise very primitive dwellings.

a lever with one of his feet and the projectile is discharged.

Tests of the device are to be made before British army experts.



Courtesy Wallpaper News

An Up-to-Date Frieze

AN AERIAL FRIEZE

The decorative value of this frieze lies not only in its artistic design, but in its expression of a current popular interest occasioned by the recent achievements in the aerial world. Such a frieze would be very appropriate as part of the decoration of the home of an aero club, although two of the types of aerial craft shown are not at all practical for real flight, as are the others. Still, there is such a thing as artistic and poetic license, which makes allowance for things in a frieze that would come to grief if launched into real air.

SIGHTING DEVICE FOR AIRSHIP GUNS

An English inventor has designed a device intended to make possible the accurate firing of guns from aerial craft, and especially aeroplanes. It consists of a cone-shaped drum surmounted by two parallel sight vanes, which are slid into line with the object when the speed and height of the aerial craft has been ascertained by the operator. The moment the sighting is accurately obtained, the operator presses

A JOURNALISTIC BUS

Just before the death of the King of the Belgians the bus shown in this illustration was stationed outside the royal palace for the use of the newspaper men. In and about it they

Temporary Newspaper Headquarters

waited for the news of his condition just before death, and for the mass of details given out after his death.

Open-Air Hospital in Japan

EARTHQUAKE DESTRUCTION IN JAPAN

Earthquakes are quite frequent in Japan, and are usually attended with great loss of life and property. The illustrations were taken at Asai Esori after the quake of August, 1909. Two of them show the extent to which the lightly-constructed Japanese buildings are shaken down by shocks, and the other shows Japanese nurses at work in an open-air hospital. In one of the

Clearing Away Wreckage

A Ruined Warehouse

illustrations is seen a steamboat that was not harmed, although the building beside which it was moored was reduced to a pile of debris.

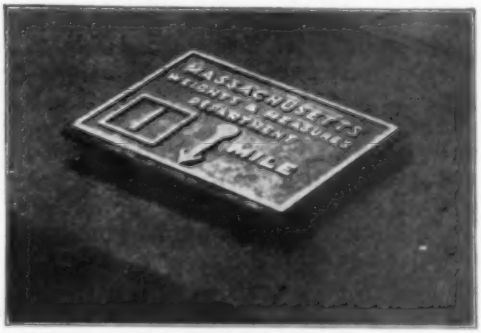
KEYLESS PADLOCK

A lock that has no key, yet can be opened in the dark as easily as a lock possessing a key, has been placed on the market by a Chicago concern. It is provided with a combination similar to that used on safes, but the mechanism is small and simple, there being but few parts, all of which are solidly riveted in, no pins, holes, or mechanism of any kind being exposed.

BOSTON'S SYSTEM OF TAXICAB TESTS

By placing bronze plates in the street curbing at measured distances the weights and measures department of Boston has instituted a method of testing taximeters while in actual operation. The plates, one of which is shown in the illustration, have been placed in the curbings of many streets at distances of 1/4, 1/3, 1/2, 2/3, 3/4, and 1 mile.

Cabs are driven over the course and officials of the department record the deviations of the taximeters. They also test the clocks that indicate the waiting time, seal the taximeters, and give a certificate if the taxicab comes up, or more appropriately down, to the standard. When running a straight course on a street provided with the distance plates, the passengers of taxicabs may also determine by comparing



Curb Plates Standardize Taxicabs

the measured distance and the taximeters whether or not the machine is working properly.

The system may be adopted in New York City.

WEIRD HARVEST POLICE OF GUINEA

In certain districts of British New Guinea the natives have a custom of

Harvest Police Starting Out on Their Beat

warding off bad crops by a secret police whose duty it is to see that a taboo is kept. The natives who belong to this band disguise themselves in all sorts of weird masks, and thus arrayed are supposed to exercise a magical power over the harvests. They go around at night performing a strange dance, and keep a good look-out that the trees in the plantations are not robbed. The lot of the harvest policeman is a hard one as he must abstain from drinking cocoanut milk and chewing the betelnut, both dear to the heart of the natives. This strange band of public guardians is called the Kaivakuku.

CURIOUS CAPER OF GAS-FILLED WELL

While cleaning out an oil well in the Maricopa field, California, a gas blowout drove the tools nearly to the top of the hole, and then began a series of mishaps worth chronicling. The trip of the cleaning tools upward made several kinks in the cable they were attached to, and when they fell back to the bottom again the cable broke.

Then began the task of fishing for the tools with a long steel spud at the end of another cable. In attempting to spud around the tools to loosen them, another pocket of gas was encountered. The consequent explosion was heard for several miles, and the long steel fishing spud and cable were blown 200 ft. above the top of the well, knocking away beams, blowing the temper screw up into the top of the derrick, and moving the crown block over to one corner. A moment later another explosion drove out the tools the drilling gang was fishing for, and these reached a height of 1,000 ft. before starting back to the ground again, where the steel stem buried 14 ft. of its length in the ground.

A few seconds later a rain of rocks, some of which weighed 10 lb. spread itself over the surrounding territory. That no one was hurt was considered remarkable.

GRIMY ELEVATED STRUCTURE MADE BEAUTIFUL

In order that the steel elevated structure might harmonize with the surroundings at Forest Hills, a suburb of Boston, a portion of it was covered with concrete and converted from a sordid looking affair into a thing of beauty. Just before entering the terminal at Forest Hills, the structure crosses a parked space known as the Arborway. The tracks of one of the big railroad lines entering the city cross the park also, and some years ago a handsome masonry arch was constructed by the company so that the appearance of the park might be preserved.

This is the first concrete covered elevated structure in the country, and its appearance has caused many to urge that all the elevated lines in Boston be dressed up in the same manner.

The average cost of the steel structure per running foot before it was em-

The Handsome Elevated Roadway After Embellishment with Concrete

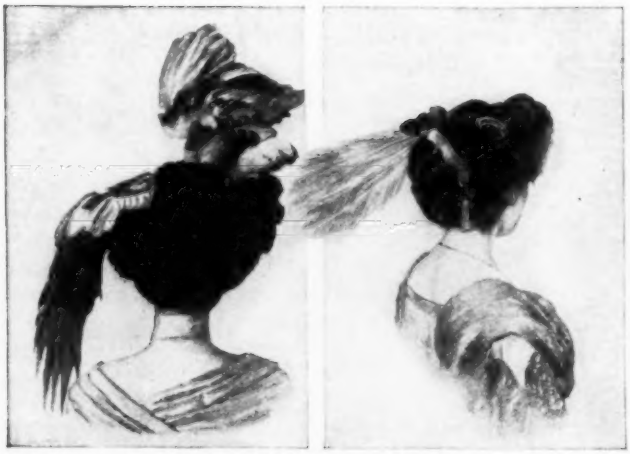
bellished was $100, but the expense of covering it with reinforced concrete brought the cost up to $280 per foot. The terminal at the end of the Arborway had been finished in concrete before the idea of covering the steel structure with the material was conceived, so that they harmonized very well. The concrete casing follows closely the lines of the steel work. A mesh of wire cloth was attached to the steel by small rods, and on this furring a 3-in. thickness of concrete was cast.

The concrete does not enable the structure to carry any additional weight but does serve to protect the steel from corrosion.

NEW FRENCH SUBMARINE

The new French submarine "Archimede" is 39 ft. longer than any other submersible war vessel yet built by that country. It has a displacement of 577 tons on the surface, and 810 tons under water. Her speed is 17¾ miles an hour, and her steaming radius is about 2,500 miles without replenishment of coal. Her tests have been so successful that the French government is to build still larger submarines.

Steel Elevated Structure at Terminal Before Treatment with Concrete



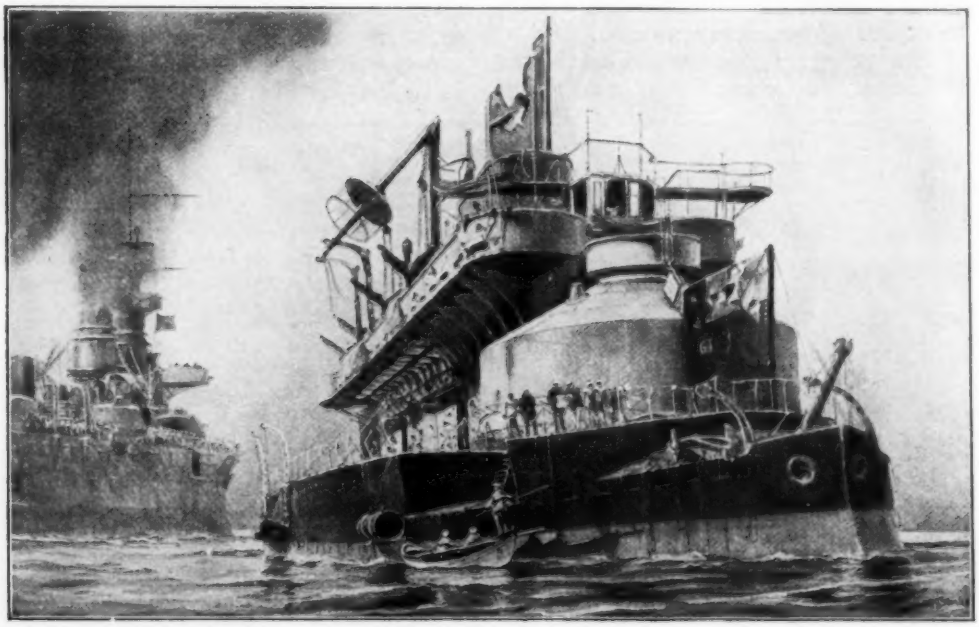
Aeroplane Coiffure — The Prize Winner

FEATHERS IN HAIR-DRESSING

These heads do not illustrate late millinery conceptions, but the latest idea in hair-dressing. They were shown at an exhibition of a society for the progress of hair-dressing recently held in Europe, and the one with but one set of feathers received the prize. The other drew attention under the name of aeroplane coiffure. One wing sticks out from the back of the head, while the other rises from just forward of the center.

DAMAGED IN GUN PRACTICE

That the practice of using obsolete battleships as targets for the guns of their newer companions has spread to the French navy is graphically shown in this illustration. The badly wrecked fighter is the "Fulminant," and the ship that accomplished the damage is the "Democratie." At the time the photograph was made the officers of the "Democratie" were aboard the "Fulminant" examining the result of the gunfire.



An Expensive Target

MONOPLANE CONSTRUCTED SEVENTY YEARS AGO

It has often been said that the beginning of the successful aeroplanes of today, dates back but a few years, yet as far back as 1840 an English engineer, William S. Henson, constructed an "aerial carriage" which contained most of the principles of modern flying machines.

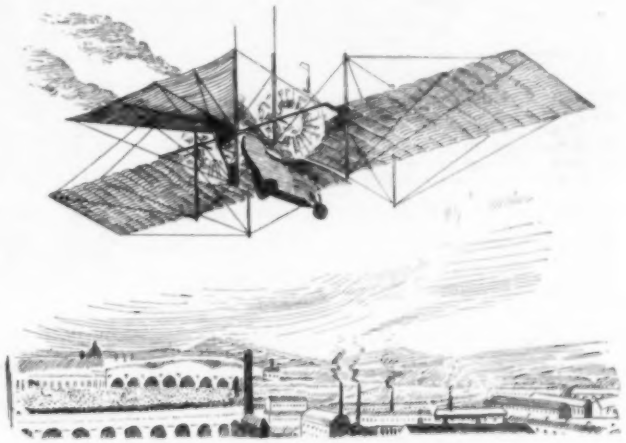
The invention did not fly because of lack of motive power. But if Henson had the great advantage of a gasoline motor of today, who can say he would not have succeeded in flying. His contrivance was of the monoplane type, and was fitted with a propeller or screw. It also had a triangular plane in the rear to guide its flight, and wheels on which it could be run along the ground until it acquired enough momentum to launch itself into the air.

In their endeavor to construct aeroplanes the inventors of today apparently failed to search out the efforts of the men who struggled with the same problems years ago, under circumstances far less propitious. Had some one picked up Henson's old idea, say ten years ago, when gas engines came into general use, and, profited by the advancement in mechanics since the day of the English engineer, the aeroplane might have reached a higher degree of development today.

The machine was constructed in 1840, only a few years after the screw had been successfully introduced on steamboats.

According to specifications on file at the British patent office the extended surface of the plane measured 4,500 sq. ft., and the tail 1,500 sq. ft. The machine weighed nearly 3,000 lb., including the steam engine with water tank and condenser. The engine weighed 600 lb. The designer intended that his aerial craft should carry 12 passengers, besides fuel, baggage and mails.

The accompanying illustration is a reproduction of a print now in possession of the Aerial League of the British Empire.



The Henson Aerial Carriage of 1843

AN AUTO MILK CART

This automobile milk-cart is part of the equipment of a large dairy situated eight miles from Reading, England. The farm is owned and managed by a woman, and her staff of helpers consists of women. The large milk cans

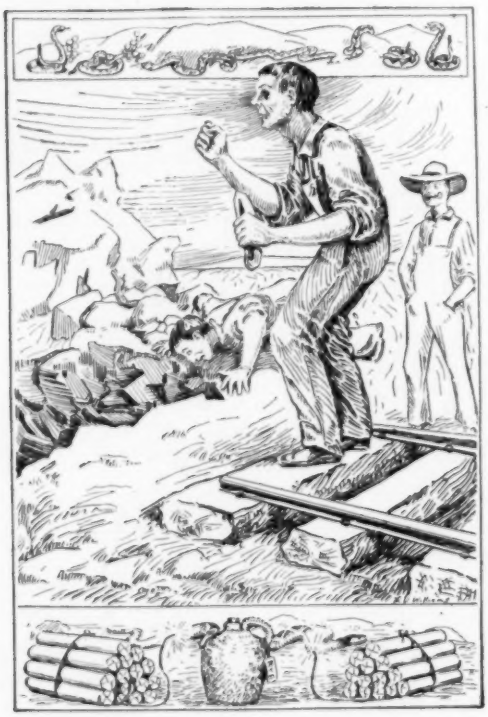
Auto Milk-Cart Driven by Milkmaid

seen in the back of the automobile were designed specially for the auto service.

An automobile ordinance in Philadelphia prohibits the use of horns that have more than one note.

The Vengeance of Scaldy Bill

McNulty had the contract for 40 miles of line
And the way he made the dirt fly was something mighty fine;
With four and 20 scraper gangs and twice 400 men
He dug the valley up and smoothed it down again.
McNulty wore a widespread smile and whistled all the day,
And all the men they jumped about like grasshoppers at play.
And all the time the dirt rolled up; it was a dandy job—
And then the right of way ran plump against Old Baldy's Knob.
Now Baldy's Knob was mostly rock with 40 million cracks
Wherein there dwelt some little snakes with spangles on their backs.
These snakes had rattles on their tails and fangs within their jaws
If met upon a summer day one wouldn't care to pause.
McNulty stopped his whistling and sent for Scaldy Bill
To fill those cracks with dynamite and shoot that ——— ——— hill;
Now Scaldy was a powderman of old time railway type;
He carried powder in his pants and smoked it in his pipe,



So there he came upon a run to quickly reconnoiter
And stepped upon a snakelet's tail just when he hadn't oughter;
The snake coiled up and sank its fangs deep in our hero's toe
And Scaldy Bill he hit the turf with accents loud of woe,
Quick came the vet upon a trot, quick came the blacksmith too,
The cook, the cookee and all the rest of McNulty's crew,
And gathered round poor Scaldy Bill as on the ground he lay;
The cook he wept, the cookee bawled, the vet he tried to pray,
The blacksmith got a red hot bolt, the vet produced a saw,
Meanwhile Old Jenson volunteered a fresh cut juicy chaw;
Get busy, quick, do something soon, don't let him die they cried;
(Will pause right here to let you know the snake had long since died.)
But ere they could get in their work our hero feebly moaned
And all the crowd in sympathy tumultuously groaned.
Then Scaldy Bill raised up his head from off the rocky ground
And said, "I often heard that whisky's good for such a wound."
So then they took our hero up and got a mighty flagon
And Scaldy Bill with right good will set out to get a jag on.
But as he drank he cursed those snakes and still his anger grew
And he vowed a deadly vengeance on all the snakely crew.
So when old Night had pulled her shades and all the camp was still,
Our hero from his cot did rise and wobbled up the hill,
And many a journey he did make out in the fearsome night
And on each trip he carried 40 sticks of dynamite;
The dynamite he put in the cracks and sand around did tamp,
Then lit a lengthy time fuse and beat it back to camp.
Bimeby there came a mighty crash and then a silence deep,
And everyone for 40 miles was wakened from their sleep.

* * * * * * *

When morning came McNulty rose and had a fearful spasm,
For where Old Baldy's Knob had stood there was a mighty chasm.

—Engineering-Contracting.

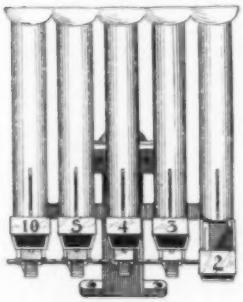
REPAIRING LINE WIRES BY SEARCHLIGHT

A great searchlight, located five miles away, made possible the quick repairing of a break in telephone lines at Tacoma, Wash., according to reports from the telephone manager of that city. A cold wind, accompanied by sleet, had covered the wires with two inches of ice, and many fell. Linesmen worked all day, and when night approached one gang was at work on main-line breaks on the side of a hill facing Tacoma, but about five miles distant from the center of the town.

The linesmen had no light, and as far as they could figure there was no possibility of getting any, but the manager went to a hotel which has a great searchlight and persuaded the management to turn it on the side of the hill five miles away. When the linesmen reported after repairing the wires they said that the light so provided was a great help to them.

SMALL CHANGE MAKER

A Chicago machinist has invented a contrivance for making small change on news stands and other places where small change must be made quickly to expedite sales. It has five tubes, 3 containing pennies, 1 nickels, and 1 dimes. By pushing down a key at the bottom with the thumb and holding the palm of the hand underneath, the desired amount of change falls out, 2 cents, 3 cents, 4 cents, a nickel, or a dime.



FLORIDA ROADS MADE OF LEAVES

Leaves would be considered a very poor material for the making of roads in most parts of the world, but in certain districts of Florida such a material is used with great success. There are miles of road that would be almost impassable by reason of the deep sand were it not for the leaves of the long leaved pine. These leaves, which are very much like straw in appearance, are raked over the sandy roadbed once a year, the task usually being performed in October.

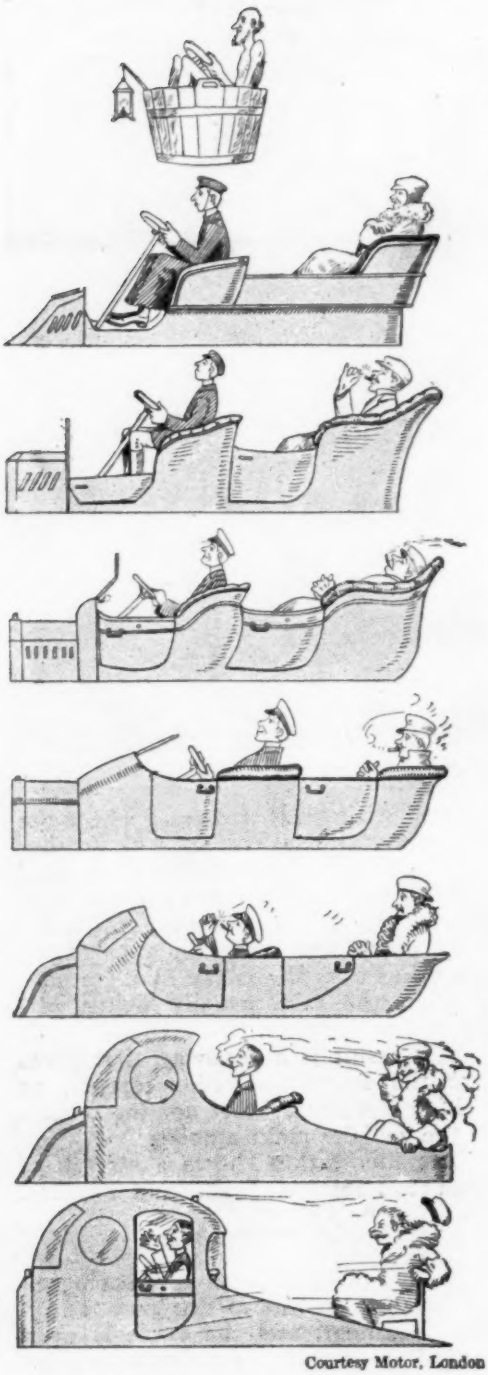
A Road of Leaves

The result is a roadway that gives one the impression of a carpet, as neither the horses' feet nor the wheels of the vehicles make a noise.

The illustration shows a stretch of such road between Eustis and Tavares.

Roller skating rinks are springing up like mushrooms in England and on the Continent, and the craze is even spreading to many of the communities of South Africa.

EVOLUTION IN AUTO DESIGN



Courtesy Motor, London

Moving Picture of Auto Body Design

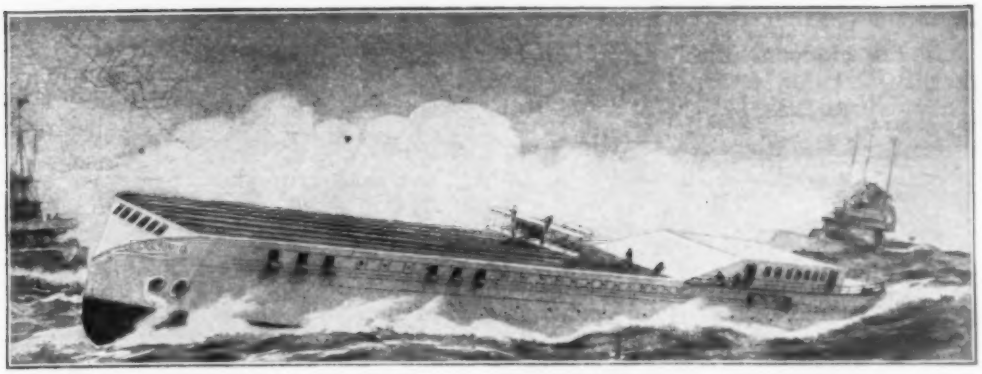
The gradual evolution in the automobile body, which is providing the occupants of the front seat with more and more protection, is shown in this series of moving-picture drawings, all of which are real but the first and the last three. The drawings beginning with the second and running through the fifth show the evolution that has brought forth the torpedo body. From then on the artist has attempted to illustrate his idea of how the front of the torpedo body will grow in size and the back shrivel unless the trend of the present evolution is changed.

SWISS RAILROAD FINDS ELECTRICITY EXPENSIVE

Electricity as motive power for the operation of railroads in Switzerland has received a blow through the reversion to steam power of the Seebach-Wettingen line of the Swiss federal railways. This line, which runs in the vicinity of Zurich, is only 12 miles long, was electrified seven years ago, and has been one of the most discussed electrifications of Europe. It was chosen for the experiment because of its proximity to a large electric plant, and was equipped to use 15,000-volt alternating current on an overhead trolley.

The general adoption of electricity on the Swiss federal railroad hinged to a great extent on the record made by this line, and although the system has been approved by the expert electrical engineers of Europe, and, as far as efficiency of equipment is concerned, has given the utmost satisfaction, the verdict on economy was adverse.

Switzerland has been considered as the best example of a country where electrification would prove most economical. It is a country of severe grades and many tunnels. Coal is high in price, while water power for the development of electricity is abundant. Experts insist that whatever economics are possible through electric power should have been most readily obtainable in Switzerland.



An Aeroplane Carrier Ship

LAUNCHING AEROPLANES AT SEA

In the present development of the aeroplane, something more than an ordinary ship's deck will be required for launching them into the air at sea, and the accompanying drawing illustrates the idea of Capt. J. P. S. Lawrence, U. S. N., retired, of the type of aeroplane ship that may evolve. Such a ship, of course, would be far more complete than that shown in the illustration, but it suffices to illustrate the deck plan.

The principal character of such a ship will be a broad, flush upper deck, clear of obstacles fore and aft, excepting a deckhouse at the stern in which to house the aeroplanes when not in use. This deck will be provided with angle irons fastened in line with the keel and properly spaced to receive the aeroplane when it settles down on the deck after a flight. Or, in other words, a series of tracks of such nature as to prevent any sliding of the machine sideways or athwartship with the roll of the vessel in a sea. Such guards will be necessary for starting, as well as finishing a flight, and, according to Captain Lawrence's idea, the aeroplanes will be provided with clamps to engage with these rails at the will of the operator.

A non-inflammable film has been placed on the market by one of the leading kodak concerns.

GREWSOME GUILLOTINE SOLD AT AUCTION

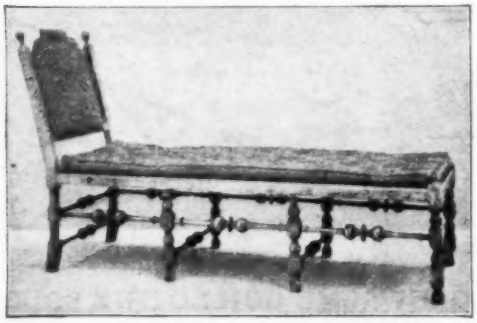
One of the guillotines used during the French Revolution was recently sold at auction in Paris, its purchaser being a music-hall proprietor in the Monmartre section. The grewsome instrument of execution under whose

A Guillotine of the Revolution

knife hundreds of heads have fallen, some, perhaps, of princely houses, sold for $180.

EARLY AMERICAN "DAY BED"

In the Hudson-Fulton exhibition of furniture at the Metropolitan Museum, New York, was shown a wonderful



Courtesy Upholsterer

Quaint American "Day Bed"

collection of American furniture and workmanship, dating as far back as 1630 and including types that have been generally regarded as of strictly English or Flemish origin.

One of the most interesting pieces was this quaint and artistic "day bed." The stretcher part is supported by eight legs, and is provided with an almost upright back or head rest. Both the back and the long seat were originally caned.

TOURING MOTORCYCLE

The most important requirement of a motorcycle used for long tours is some kind of a seat more comfortable than the ordinary bicycle saddle with which nearly every make of motorcycle is now provided. How such a requirement has been met by an English motor company is shown in this illustration of a totally new type of motorcycle. The bicycle saddle is replaced by a comfortable bucket seat with back-rest, the pedals have given away to running boards on each side of the machine for the feet, and three speeds are provided by a gear box in accordance with the latest automobile practice. The absence of pedals makes impossible the starting of the motor by pedaling, therefore a long lever is provided which operates a beveled quadrant meshing with a small bevel freewheel on the forward end of the crank shaft.

The frame of the machine is supported in front and rear on laminated steel springs, so designed that any movement caused by the irregularities in the road is absolutely vertical. Behind the back of the seat is a locker for the storing of small articles.

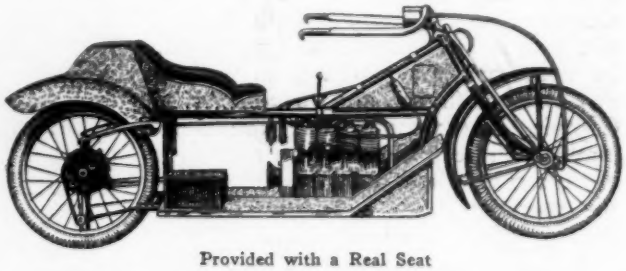
CAUSE OF AURORA BOREALIS

A newly discovered gas called "neon" is said by Dr. W. L. Dudley, head of the chemistry department at Vanderbilt university, to be the cause of the aurora borealis, a phenomenon that has always puzzled scientists.

Dr. Dudley has discovered that the friction of neon against mercury in a Crookes' tube produces a yellow light that becomes vividly illuminated under the effect of Hertzian waves when held near a wireless coil. He therefore concludes that this new gas, under high pressure because of the cold, is acted upon by magnetic currents in the vicinity of the magnetic poles of the earth, thus making the aurora borealis.

Dr. Dudley has in his possession what he claims to be the only sample of neon in this country. It requires more than 100 tons of air to produce a pint of the new gas.

Although the thermometer was hovering near the zero mark, Strang, in a 120-hp. machine, covered 5 miles in 3 min., 17 sec. on the Indianapolis speedway in December.



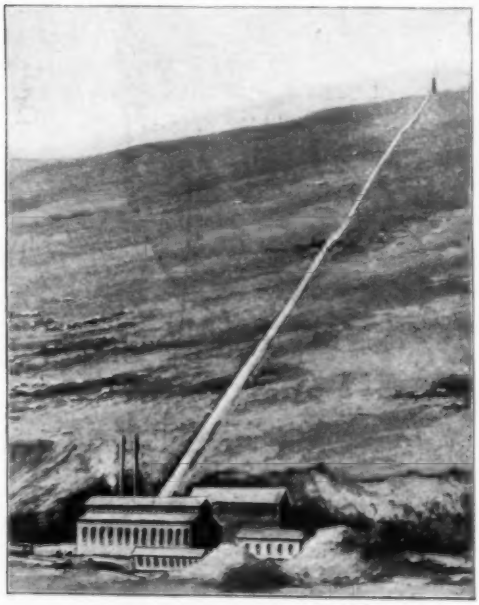
Provided with a Real Seat

and a connecting length of flexible rub-

CHIMNEY TWO MILES LONG

One of the most curious chimneys in the world is the property of a copper works at Cwmavon, in Gbamorganshire, Wales. It is two miles long and has a brook running through it. The copper works is at the foot of a long and high hill, and the chimney runs continuously from the base to about 100 ft. above its summit, following the natural slope of the ground to the top, where it shoots straight upward as does an ordinary chimney. A small spring gushing out near the summit of the hill is turned into the chimney, and flows through nearly its entire length, condensing the smoke. Once a year the chimney is swept out, and about a ton of precipitated copper is obtained.

The purpose of this extraordinary chimney was to remedy the destruction caused throughout the surrounding country by the copper smoke. For many years it had proved a plague to the entire country-side, destroying many thousands of acres of grass and



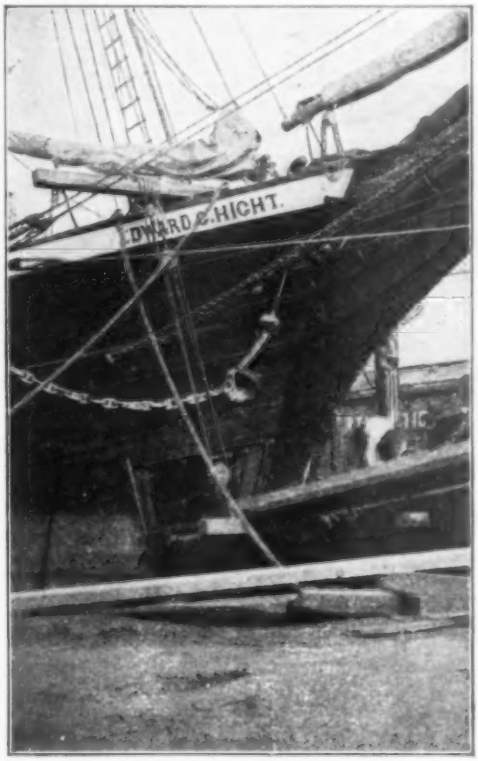
Longest Chimney in the World

affecting the hoofs of cattle to such an extent that gangrene was caused.

The top of the chimney is visible from a distance of 40 miles.

SCHOONER WITH HATCH IN BOW

A unique method of loading long sticks of lumber in a schooner is shown



How It Is Done

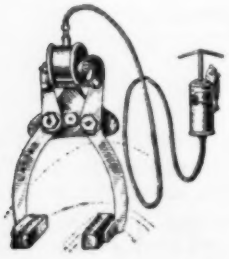
in the accompanying illustration. In the bow of the vessel is a large, square opening known as the "lumber port." After the cargo has been placed in the vessel the port is closed with a hatch, which is lashed to ring-bolts on the inside of the hull. Then the seams are caulked with oakum and the vessel is ready for sea, as tight as though her bow were solid.

The Japanese have invented a way of making milk from the soja bean, which is used as a beverage, used in tea and coffee and even frozen for ice cream. The bean is first soaked and then boiled in water. After the liquid turns white sugar and phosphate of potash are added.

The hanging of Judas in effigy in all parts of Mexico at 10 o'clock in the morning of the day preceding Easter is a custom of great interest to all tourists as well as the Mexicans. The effigies are made of tissue paper, and to them and from the wires used to suspend them are hung firecrackers. These are ignited at 10 o'clock. Four effigies of Judas are shown in the illustration, which was taken in front of the state palace in the city of Guadalajara.—Photograph by F. F. McArthur.

HYDRAULIC BRAKE FOR BICYCLES

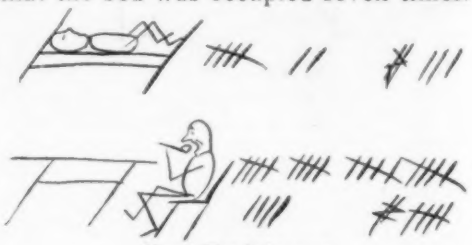
This unique but effective bicycle brake is hydraulic in its operation, being based upon the incompressibility of water. The device consists of a pair of rubber-padded brake jaws, attached to the frame of the bicycle in such manner that the jaws engage with the rear wheel tire when closed; a brass cylinder with piston, attached to the bicycle frame in a position to be easily reached; and a connecting length of flexible, rubber-lined tubing.



The tubing and cylinder are filled with water, which, when the piston is pushed down, is forced into the cylinder-head of the jaws, thus pushing them against the tire. When the pressure on the piston is released, the pressure pushing the jaws closed is likewise released. The water acts simply as a transmitter of power, and never has to be renewed.

EXTRAORDINARY BOOKKEEPING

A method of bookkeeping as novel and ingenious as it is pathetic was discovered a short time ago by a New Orleans business man who had been obliged to spend a few days in an out-of-the-way country place. The hotel was postoffice, country store, jail, and all else of a business nature the place possessed, but the proprietor and hotel manager could not write. On leaving the place he was presented with the bill shown in the drawing. The figure in the bed means just what it implies, and the four ones with the line drawn through the two ones following, means that the bed was occupied seven times.



Novel Hotel Account

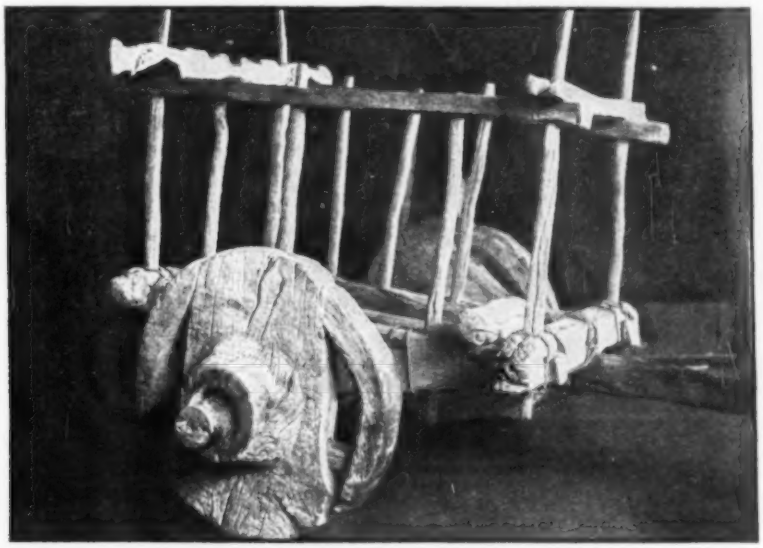
The dollar sign and three ones designate that the fee for this privilege was $3. The figure drawn as seated at a table and the marks following show that 24 meals were eaten at a consideration of $5.

The damaged bow of the steamer "Tenasserim" was recently cut completely away by an oxygen-acetylene burner. This demonstration of the new process of cutting by heat occurred at Glasgow.

CLAIMS OLDEST VEHICLE IN AMERICA

What is claimed to be the oldest vehicle in America is in possession of the Chamber of Commerce, Los Angeles, Cal. It was made by the Pueblo Indians of Tesuque, a village nine miles from Santa Fe, New Mexico, and was purchased in 1878 from a native named Alfonso, who at that time was 85 years old. His statements and the traditions of the village were to the effect that the big, clumsy ox-cart, or carreta, was handed down from father to son for sufficient generations to place its origin in the seventeenth century.

Capt. Newton H. Chittenden, the explorer, travelled about the country exhibiting this relic of bygone days in the Southwest, and finally, in 1896, on the third of November, he made an election bet that if McKinley should be chosen president, the carreta should be presented to the Los Angeles Chamber of Commerce. Late in the same month he made good his promise and brought the ancient vehicle from Redlands to its destination on its own wheels. The distance of 60 miles was covered in six days and since then this



Primitive Indian Cart

Whether or not its age is as great as that, the primitive cart is interesting, both for its known history and the oddity of its design and workmanship. It is composed of wood and rawhide throughout, no metal being used in its construction. The wheels are heavy sections of sycamore, with clumsy, bow-like pieces of rim secured opposite each other on each wheel. The diameter of the two ungainly wheels is 38 in. The axle is of hard wood and the 12-ft. tongue consists of a single length of mesquite. The body of the vehicle is 6 ft. long and very broad and high in proportion. It is of a rude, rack-like construction. durable specimen of workmanship has been the chief attraction of the permanent exhibit.

FLIES TO THE HUNT IN AEROPLANE

Receiving an invitation to join a hunting party at Berru, France, Hubert Latham loaded a double-barreled shotgun aboard his monoplane and flew the distance of 15 miles between his garage at Mourmelon to the place of the meet. After a successful day's shooting, the aviator reascended for the homeward journey, carrying with him not only his gun, but considerable game.

GOATS GRAZE ON ROOFS IN SCANDINAVIA

When the goats of northern Scandinavia grow tired of their pastures and

An Enjoyable Meal

long for something new they do not devour tin cans and old clothes. They climb up on the top of a house and eat the roof. In fact, sod roof is considered very choice by epicurean goats, even being rated above soft leather shoes. Many of the houses in the northern part of Scandinavia have sodded roofs, timbers covered with earth and sods. This has been found very effective in keeping out cold. Luxuriant crops of grass and mosses spring up, and when a goat pines for a chance to tackle it and is unable to climb up his owner sometimes helps him up so that he may improve the appearance of the roof by eating off the high grass. This photograph was taken at Hammerfest, one of the northernmost towns of Norway.

THE TURQUOISE ANCIENT AND MODERN

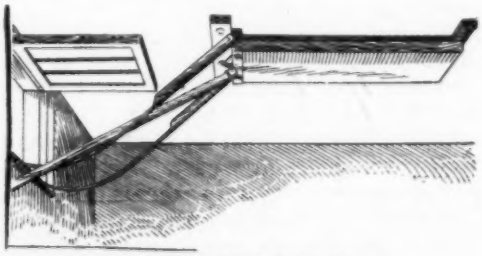
The turquoise is not only a precious stone of modern adornment but of ancient times as well. The Mohammedans used the polished gems for decorative and ornamental effects in their places of worship, as did the ancient Peruvians and Mexicans in beautifying the altars and temples of the sun. They were also used for personal adornment, many beautiful specimens being found among the gems of ancient rulers.

Regardless of the fact that until about 30 years ago most all the turquoise on the market came from near Nishapur, Persia, the mining of the gem by Pueblo Indians antedates the discovery of America by several centuries. The workings at Mount Chalchihuital, south of Santa Fe, had attained huge proportions before the advent of the Spaniard in America. Chalchihuital is the Pueblo Indian name for turquoise.

The American turquoise has largely supplanted the oriental product.

FOLDING COAL CHUTE OF STEEL

The device, shown up against the ceiling and out of the way in this illustration, is a solidly-constructed and practical coal chute when dropped into position for use. In the position shown it does not interfere with the opening or closing of the window sash and takes up only 4½ in. space next to the



Coal Chute That Folds Away

ceiling. It is lowered into position or raised by means of a handle on the outside.

Our National Folly

Fifty Per Cent of the Fire Waste of the United States from Easily Preventable Causes

By ALFRED STUMPE

THE rumor abroad in the financial world that several of the principal foreign fire insurance companies are about to reinsure their lines preparatory to retiring from the field of American underwriting, may, if true, bring us to a realization of our stupendous national folly. The average annual fire waste of the United States for the five years ending with 1907 was $252,000,000, and the losses for the year 1908 beginning with $24,000,000 in January and steadily increasing, aggregate over $200,000,000. Although there were but seven fires during the year 1908 where the losses were $1,000,000 or more, the aggregate loss equals that of the year of the great Baltimore conflagration. When the business man of large interest faces a restriction of his credit due to the fact that he can no longer obtain sufficient fire insurance to cover his combustible holdings, the fact that we may have been burning up $500 worth of property every minute, day and night, for the past six years, may at last penetrate his consciousness.

What if we were to lose a quarter of a billion dollars every year in wheat, or cotton or beef? What if such a value in shipping should sink in New York harbor? What if the national treasury should be looted annually of that amount or business failures approximate that figure?

The San Francisco calamity forced several insurance companies out of business. In the last 50 years 1,000 insurance companies in the United States, or more than three times the number of existing companies, have been forced to withdraw. In the last 10-year period the insurance business suffered an underwriting loss of 4½ per cent, or over $86,000,000. Who will continue to supply responsible capital indefinitely for the national ash heap? The average American in his reckless individualism has assumed no responsibility for the fire waste, leaving it to the insurance companies to refill their purses by increased premium rates.

State legislatures have made frequent efforts to prevent the advance in insurance rates by various legislative enactments but legislation cannot prevent rates being sufficient to pay losses without seriously reducing the ability of their constituents to obtain necessary insurance. Any legislation which will reduce the annual fire loss, will, at the same time, reduce the average insurance rate. Unless this annual fire loss is reduced, it may soon come about that capital will withdraw from the business of underwriting without the spur of unfriendly legislation; the losses alone and the national indifference to them being quite sufficient an incentive.

A fire in the congested portion of New York City covering an area as large as that of San Francisco would put every fire insurance company in the country out of business. It is well recognized that the Chelsea, Mass., conflagration may be duplicated any day; there is scarcely a city in the country which does not offer the conditions for such a fire. Meanwhile what is the good citizen doing? It has not yet dawned upon him that he can do anything.

A man in Boston who recently turned two Back Bay houses into one by cutting doorways in the party wall, protested against the recently adopted city building law which required him to install tinclad fire doors as a fire stop. He gravely declared that a fire was no more likely to start in one house than in the other.

The declaration of experts that over 50 per cent of the present fire waste of the country is from easily preventable causes indicates that the entire nation might well be taught lessons in individual responsibility. Correction of care-

less habits is certainly possible in both grownups and children. Many of our national sins, however, can only be corrected by collective action. It is too much to expect that our people, in their impetuous haste and rush, will, in the very near future, cease to erect the inflammable shells they now put up and fill with equally inflammable contents. We differ from the Europeans in solidity of character; and our character is reflected in our architecture; but we can at least make reasonable laws to protect us from the carelessness of one another without going to the extent of the French statutes, which makes a property owner liable for damage if a fire spreads beyond his premises.

Unfortunately no sense of the immorality of needless waste has yet moved us. Superinduced by the mental habit of considering our national supply of raw materials inexhaustible, is the thought that fires do not matter so long as there is insurance capital to pay for them. As we are beginning, however, to conserve our forests we may come to consider that the things our hands have builded may be also worth saving.

We may come to look with disfavor upon buildings of great areas without fire cut-offs, with huge floor openings, with unprotected windows. We may come to demand that our fireproof buildings shall be really fireproof, knowing that steel-work improperly insulated will buckle in a hot fire, even if it does not collapse. In the rush into concrete building now evident, we may demand honest mixture of cement, and the use of sand sharp enough to bind it, instead of the water-worn pebbles which will aid the crumbling process. We may cease our folly in making floors 10 in. thick and enclosing stairs and elevators in a wall of equal thickness to prevent the spread of fire from floor to floor—and leaving our only window protection to ⅛-in. window glass, when strong and serviceable wired glass held in metal frames is available.

But who is to lead us into thus looking after our created property resources? There was organized some years ago the National Fire Protection Association. It has done much good work. By the public spirited action of the men composing it tests of devices and materials have been made at its laboratories in Chicago and the results published for free distribution. These reports should be of vital interest to every architect and builder, but few of either profession know of their importance and value. Architects make plans for elaborate and deadly fire-traps and builders faithfully execute these plans in cheap and shoddy material.

Ignorance of the law does not save a man in court.

How long will ignorance of fire protection and prevention continue to exonerate conflagration-breeders before the bar of public opinion?

X-RAY TO SHOW REAL AGE OF CHILDREN

The real age of a child is not a matter of years but of development. A child of eight may not have developed beyond the point reached by most children at six or seven.

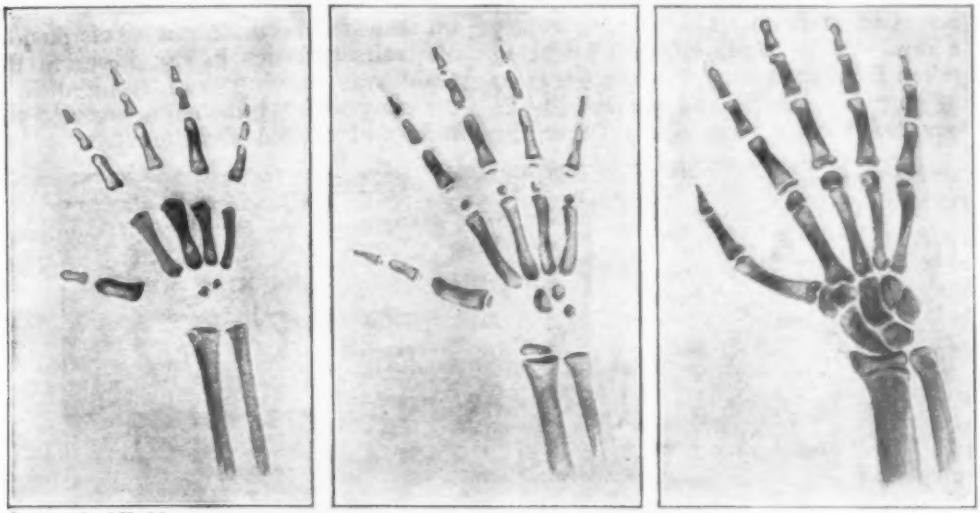
While this fact has been known to scientists for years, no attempt has heretofore been made to set a standard by which the degree of development could be ascertained. In the public schools the capacity of children to absorb knowledge has always been set by their chronological age.

Prof. Thomas M. Rotch, of Harvard University has solved this problem, according to "Good Health." After a series of investigations at the Children's Hospital in Boston he declares that the X-ray is the means by which this may be ascertained, and that, finding the physical development, it is easy to classify the degree of brain vigor.

Prof. Rotch found that changes take place progressively in the shoulder, elbow, wrist, hand, hip, knee, ankle and foot. After careful study he decided to base his classification of the different periods of child life upon the stage

of development of the wrist and hand. Photographs of the child's wrist and hand made by a half-minute exposure under the X-ray prove reliable indexes to actual age, he declares.

This development, which is of such



Courtesy Good Health

X-Ray Photographs of the Hands of Children 6 Months Old, 2 Years and 9 Months of Age and 13 Years Old

significance to science and which is made visible by the use of the X-ray, is to a great extent the growth of the bones. In the infant cartilaginous tissue takes the place of bones, but as the child grows older this tissue gives way to the harder and stronger formation.

The finding of the physical age of the child would not only prevent the forcing of children beyond their normal capabilities in the schools but it would aid in the solution of the child labor problem. It is Prof. Rotch's theory that all children should be examined for the determination of their development before they are allowed to go to work.

The X-ray photographs proved that the size or appearance of the child's hands was no criterion. A tiny hand and a large one may show the same degree of development under the X-ray.

Skin from the bodies of 347 persons was recently grafted onto the burned body of an electrician of Walla Walla, Wash. About 900 square inches of skin was used.

CHINESE USE RED FLAG FOR ROAD BUILDING

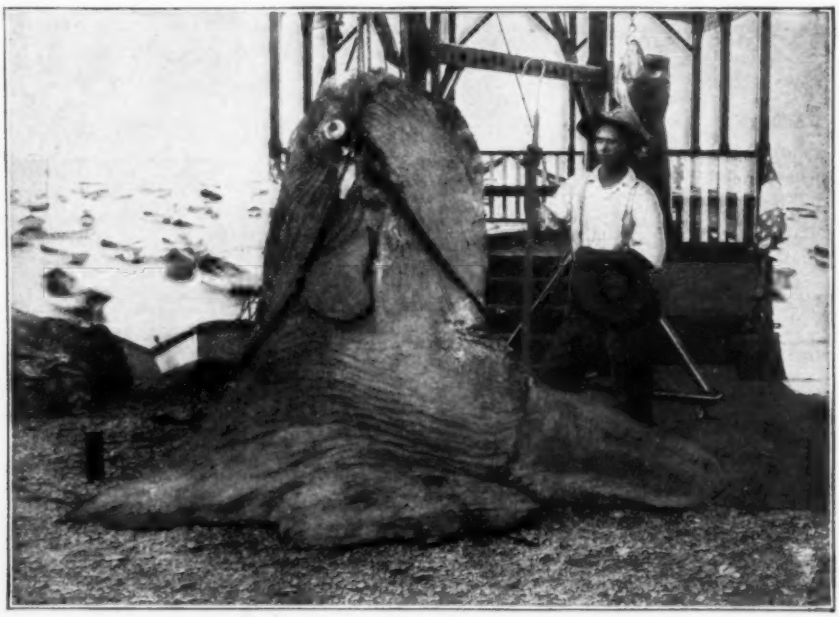
In England the law prescribes that when a steam roller is at work on the roads that a man shall precede the roller carrying a red flag to warn pedestrians and vehicle drivers. In some strange manner the Chinese road builders got hold of the idea. They have no big steam rollers in the interior, but the custom of carrying a red flag before the roller has in some strange way penetrated the inland provinces, and even when they are using the slow, 4-native-power roller, one of them always walks solemnly in front with a red flag. They seem to believe that it has some power to improve the work, for there is small danger of running down even

Warning of the Approaching Roller

a snail. A London cartoonist, making a trip through China, was struck with the humor of it.

A 1,600-POUND SUNFISH

The accompanying picture illustrates a sunfish, caught at Catalina Island, which is probably the largest fish of the kind ever brought to land. Its weight was computed, by weighing it in pieces, at 1,600 lb., or nearly a ton. When made helpless by being taken from the water, it became a mass of jelly-like flesh, and seemed to be covered with a skin not very unlike that, in appearance, of an elephant.—Contributed by Charles Alma Byers, Los Angeles, Cal.



Largest Sunfish Ever Brought to Land

A CREEPING RAILROAD TRACK

In the past few years the Lehigh & Hudson River railroad has experienced much trouble with a section of "creeping track" near Sand Hill, N. J. The track runs on a roadbed that stretches for about three miles over a constantly wet stretch of meadow which was evidently a lake bottom at one time. The roadbed practically floats on the turf surface of a considerable depth of alluvial mud.

There is no grade or curvature of the roadbed, but the track has crept as much as 13 ft. in one week, and under a heavy train single tracks have moved as much as 2½ in. The movement is caused by the roadbed sinking under the weight of the train, thus producing the effect of running up-grade on an unsolid foundation. This pushed the rails and ties in the direction the train was moving, and resulted in a creeping which bunched or skewed the rails and caused derailments.

After much experimenting the roadbed has now been laid with 100-lb. rails, 33 ft. long and the tracks are also broken with compensating switch points, to permit movement without distortion. So far there has been no perceptible wave in the rail in front of the locomotive, as previously.

WIRELESS DISEASE

In order to protect the eyes from the ultra-violet rays scattered about by wireless receiving equipment it is proposed to provide yellow or orange glasses for wireless operators in the French navy.

According to M. Bellile, surgeon on

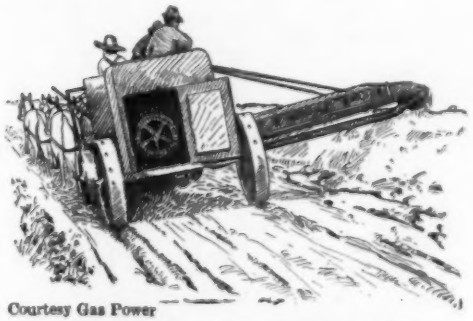
board the "Descartes," the members of the ship's crew employed in the wireless work have developed various affectations in consequence of the Hertzian waves. Trouble with the eyes was the most common, and in one case partial blindness was caused. Two cases of eczema, one on the wrist, and the other on the eyelid, were traced to the wireless. M. Bellile also believes that many of the cases of neurasthenia, now becoming common among French naval men, may be due to work with the wireless sending and receiving apparatus.

To sum up the whole, he believes, that if precautions are not taken, disaster of the kind that played such havoc with X-ray operators may result.

MOTOR-OPERATED ROAD GRADER

This new type of road grader, although drawn by horses, is provided with a gasoline engine to operate the dirt elevator. Its great advantage lies in the fact that, being provided with such an engine, the machine does not depend upon drive from the wheels for power to convey the dirt, consequently wet or loose ground has no effect on the operation.

The dirt elevator consists of a belt, 36-in. wide, which conveys the dirt turned up by the plows under the machine to the side of the road. The engines are inclosed in a metal compartment at the rear which thoroughly protects them from dust, mud, and dirt, or other extraneous matter.



Courtesy Gas Power

Carrier is Operated by Gasoline Engine

UNIQUE RABBIT TARGET

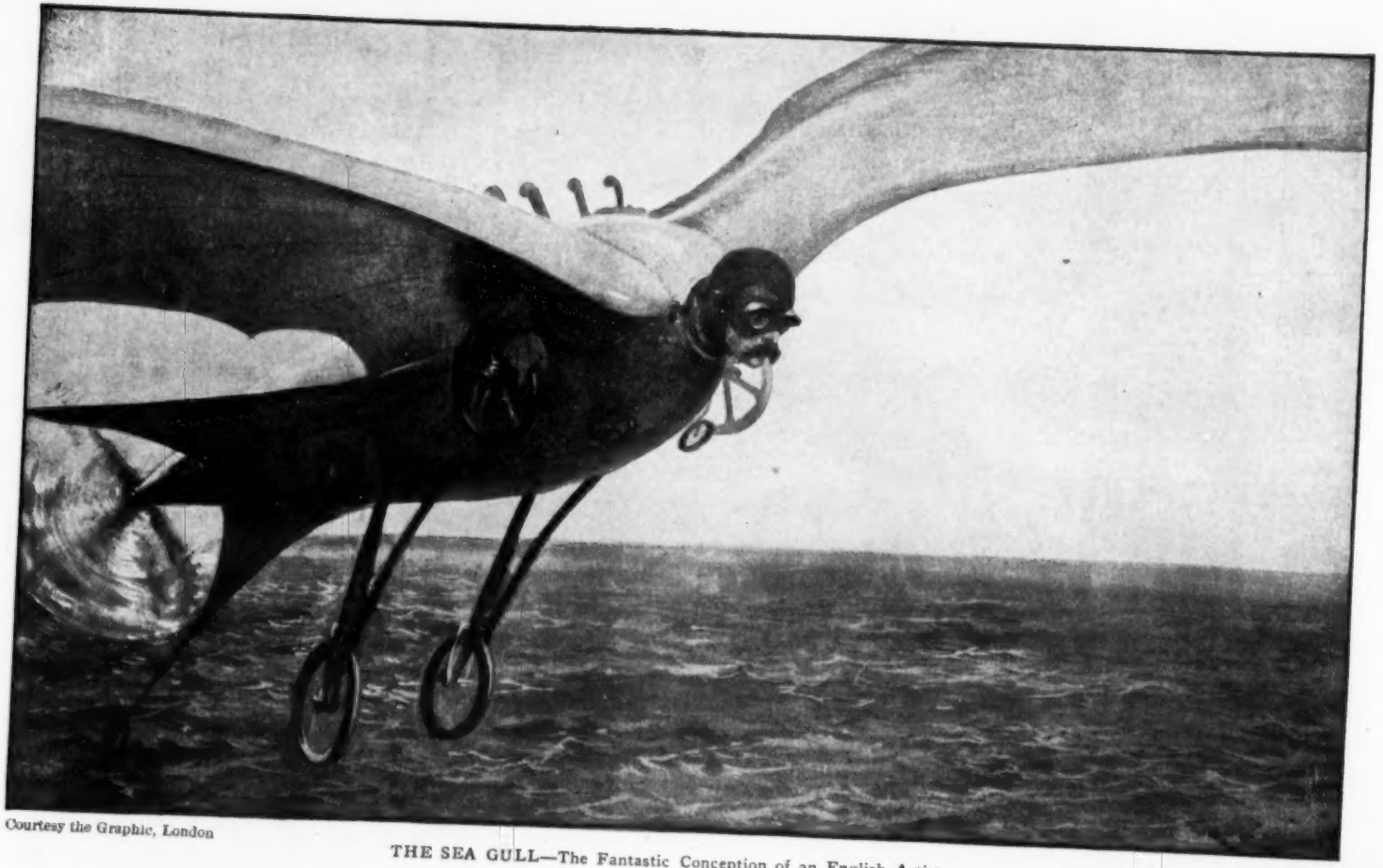
At a school of hunting near Paris there is in use a metal "running rabbit," which runs along on rails. It is claimed that by the use of this one may become a practised rabbit-shot in a very short time as there is always a rabbit to shoot at. Realism is added to the movements of the rabbit by the fact that during its run it disappears behind bushes, behind small wicker arches and small mounds. When properly hit the "rabbit" springs off its running base. The contrivance runs by its own momentum, along sloping ground.

Courtesy London News

Learning to be Hunters

PRODUCTION OF TUNGSTEN

The production of tungsten concentrates in the United States for the year 1909 was 1,958 tons, valued at $746,130. Of this amount Boulder county, Colorado, produced 1,401 tons, valued at $550,280. The ore was 60 per cent tungstic trioxide. The output in 1908 was only 671 tons.



Courtesy the Graphic, London

THE SEA GULL—The Fantastic Conception of an English Artist

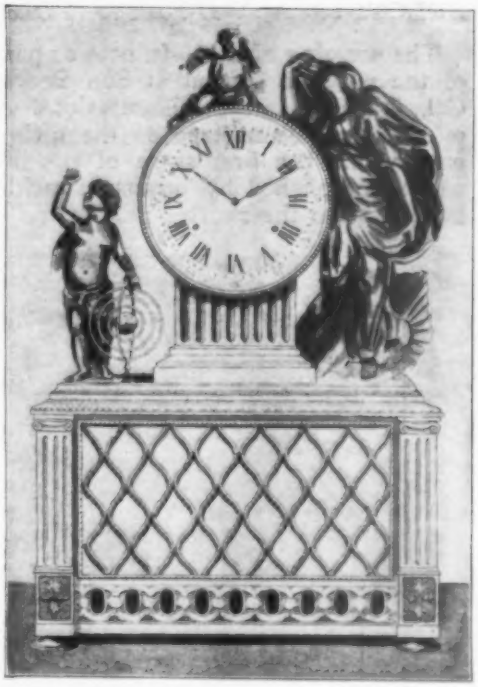
STORM SIGNALS DISPLAYED AT SEA

Storm signals are displayed in all United States ports by the weather bureau, a service of inestimable value, but if the plans for the future are carried out as completely as now contemplated the service will extend to sea, and all ships equipped with wireless instruments will receive reports from the weather bureau and display signals for the benefit of other vessels. The plan has already been adopted by the Clyde, Mallory, Southern Pacific, Ocean Steamship and Ward companies.

A BELL-RINGING TRANSFORMER

The transformer illustrated utilizes alternating current for ringing electric bells, annunciators and similar apparatus in the place of dry cells, which are always the source of trouble. It is built for 110-volt circuits and has a secondary winding with taps brought out so as to obtain 4, 8 and 12 volts, depending upon the connections.

The primary leads consist of two rubber-covered flexible cables brought out through an insulating piece which prevents any injury to the winding due to the pulling of the leads. The secondary terminals consist of three binding-posts giving three combinations of voltages. The case is of cast aluminum highly decorated to make a pleasing appearance when put in the place of dry cells.



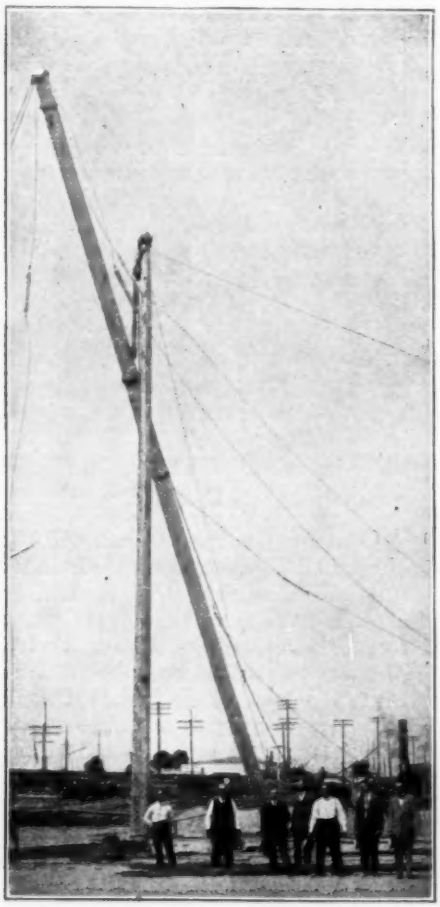
MARIE ANTOINETTE'S MUSICAL CLOCK

One of the many beautiful clocks cherished by Marie Antoinette was the musical clock shown in this illustration. It was made in 1736, and plays airs from Gluck and other old composers, but until a recent date had been silent for 100 years. Being very fragile it is only set going for notable visitors to the palace of Versailles. The King of Portugal was the first to hear it since it was restored.

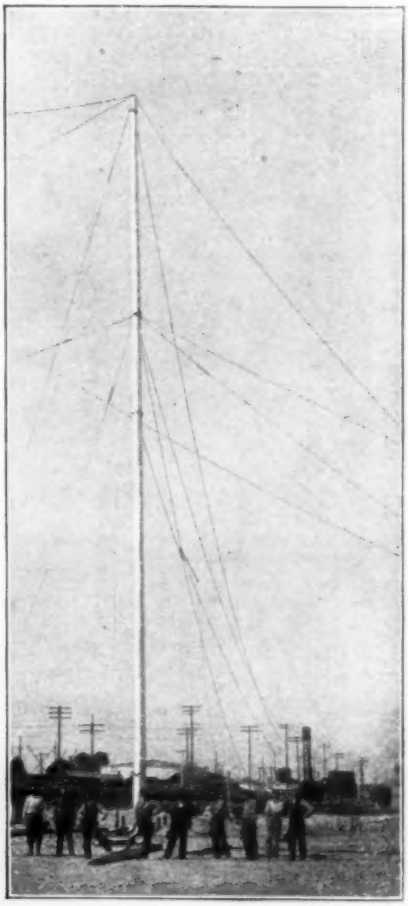
The first all-American exposition ever held in a foreign country will be held in Berlin next summer. Prince Henry of Prussia, has accepted the position of honorary president of the German reception committee and J. Pierpont Morgan is the honorary president of the American committee. The promoters state that the object is to present to the commercial heart of Europe an epitome of our industrial achievements, our natural resources and our progress along artistic and intellectual lines.

ERECTING A WIRELESS POLE

The erecting of a 146-ft. pole as part of the wireless station at San Pedro, Cal., is shown in these illustrations. A pile driver was utilized as the lifting power, and the first stage of the lift was accomplished by means of tackle made fast to the shorter pole.



Erecting Wireless Pole at San Pedro



The Pole in Position

The station has been in operation for some time, messages being sent and received daily from San Francisco and other coast ports. Messages have also been picked up from 850 miles out at sea.

The Radium institute of America, whose purpose is to study radium, was recently organized in New York.

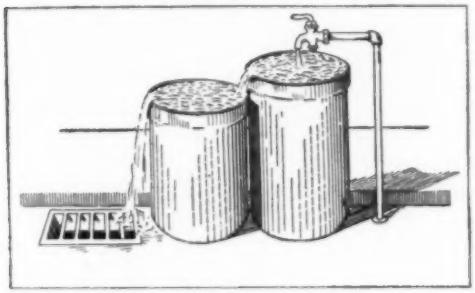
OLIVE PULP FOR FUEL

The vast amount of pulp left after the oil has been extracted from olives has been thrown away as useless, but if experiments now being carried out prove as promising as is expected, the olive oil plants of the Pacific coast will find such pulp an asset instead of a waste. The tests are said to show that the pulp, when fully dried, burns more freely than hardwood, lasts as long, and produces a much more intense heat. The amount of pulp thrown away by the olive mills of California is claimed to be so immense that it will not only provide all the fuel required in the extracting of oil but will fill the requirements of other concerns as well.

SHOP NOTES

Watering Trough Made of Cast-Iron Pipe

A practical and useful trough for horses can be made from heavy cast-iron water main pipes as shown in the illustration. An eastern city makes use of such a watering trough in one of the main streets. Two large pipes are placed on end with the flanged part upward, one to overlap the other so the water may flow from the first one, which is fed by the water pipe, into the lower one, then into a near-by sewer.

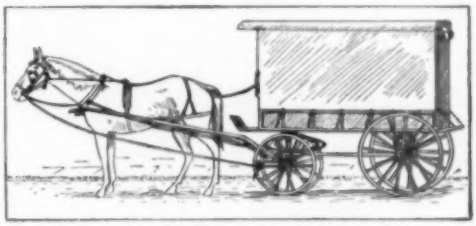


Water Mains on End

The bottoms of the pipes are made tight with cement.—Contributed by T. Canary, Chicago.

New Way of Tying a Horse

If you do not have a strap with a weight attached, and wish to tie a horse where there is no hitching post, fence or tree, fasten a line to a spoke on the inside of the front wheel of the vehicle,

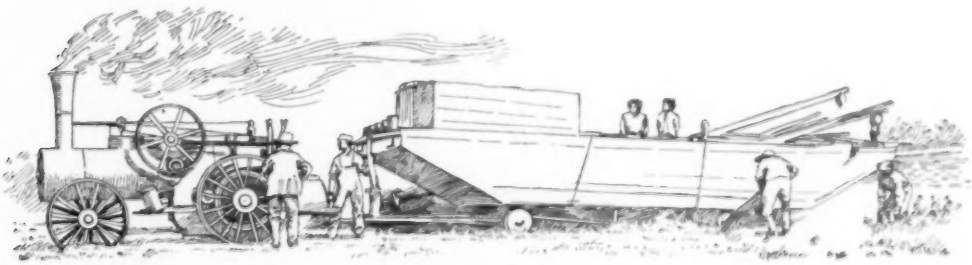


Horse Tied to the Wheel

allowing just enough loose rein so the head of the horse will be free. If the horse starts, his head will be drawn down as the wheel turns around. This method of tying will not allow a horse to take more than two steps.—Contributed by W. MacMurtree, Philadelphia, Pa.

Traction Engine Hauling a Scow

A home-made scow equipped with an 8-hp. gasoline engine was used on Gananoque lake, Ontario, for freight. The owners decided to remove the scow from the lake and place it in the waters of the St. Lawrence river. The scow was rowed down the Gananoque river, as some places are very shallow, hauled out of the water and mounted on a home-made truck having wood wheels. A traction engine was hired to pull the truck with its load. The engine accomplished its part easily and the scow was soon launched in the river.—Contributed by Wilfred Henderson, Gananoque, Ont.

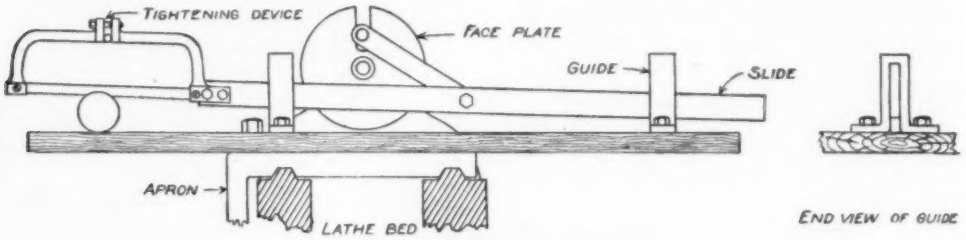


Transferring the Skow from the Lake to the River

Hacksaw Attachment for a Lathe

The power hacksaw attachment for lathes as described in the following is one of the handiest tools about the small shop, and is inexpensive and easy to make.

The entire working parts are mounted on an oak plank, 1 in. thick. The plank in turn is bolted to the lathe apron by means of two ½-in. bolts placed in the grooves. The device consists principally of a slide, two supports one at each end of the slide, a connecting rod for operating the slide, the saw and saw frame.



The Hacksaw Attached to a Lathe

The slide is a flat piece of cold rolled or machine steel, ⅜ in. thick, 4 in. wide and with a length depending on the size of the lathe and length of stroke required. A hole is drilled near the center of the slide for the bolt holding the connecting rod.

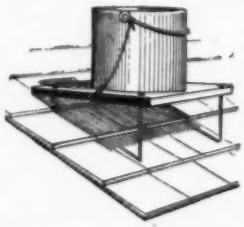
The two supports used to guide the slide are made of brass for convenience in bending and are about ⅜ in. thick and 2 in. wide, the length depending on the height of the guide. A very small clearance is given for the slide and good service will depend on a liberal application of grease. A small filler of brass is used to keep the slide from rubbing on the board. Two ½-in. bolts hold each of the supports to the wood base.

The connecting rod is merely a strip of flat steel about ½ in. thick, 2½ in. wide and of a length suitable for the stroke wanted and the size of the lathe on which the saw is used. This is connected to the faceplate of the lathe and the slide by means of a couple of ¾-in. bolts. The stroke of the saw depends on the distance from the center of the lathe spindle to the bolt on the faceplate. Decreasing and increasing this distance shortens and lengthens the stroke respectively. If the lower edge of the faceplate comes below the top edge of the slide, the connecting rod will have to be built out from the slide by means of washers to prevent the bolt on the faceplate from striking the slide. This also depends on the swing of the lathe.

The saw and holder is extremely simple and efficient. The tightening of the saw is effected by drawing up on the bolt. The frame is made of light steel forgings. The device will be found useful in many shops where the work is not sufficient to require an expensive machine.—Contributed by J. H. Crawford, Schenectady, N. Y.

A Roof Painter's Pot Jack

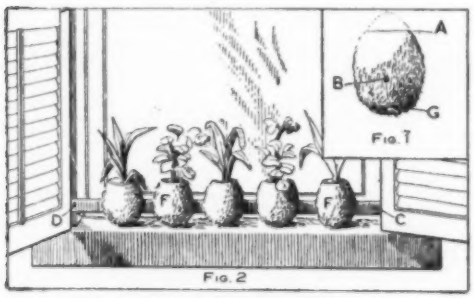
The paint pot is a cumbersome thing to handle when painting on a roof and for this reason I constructed the pot jack, illustrated in the sketch. The jack consists of a board about 7 in. wide and 8 in. long with nails driven through each corner for legs. Two short nails are driven in one end and two spikes in the other. The length of the nails will depend upon the pitch or slope of the roof in making the board rest horizontal when their points stick into the shingles. The paint pot is secured to the jack by a



cord or small wire attached to the bail and hooked over a small nail driven into the edge of the board. The jack will prevent overturning the paint and will lessen the danger of the painter falling from the roof in trying to hold his paint pot.—Contributed by A. M. Bryan, Corsicana, Tex.

A Window Flower Garden

An attractive set of flower pots made of cocoanut shells, to take the place of a window box, is shown in the accompanying sketch. After extracting the milk from the cocoanut, cut the shell on the line A and carefully bore a hole at B. Dye or stain the shells dark green and fasten them with screws through the holes B to a strip of wood C, ¼ in. thick, 1½ in. wide, as long as the window is wide, and painted green to match the stained shells. The stick can be of such a length as to fit the



Cocoanut Shell Window Garden

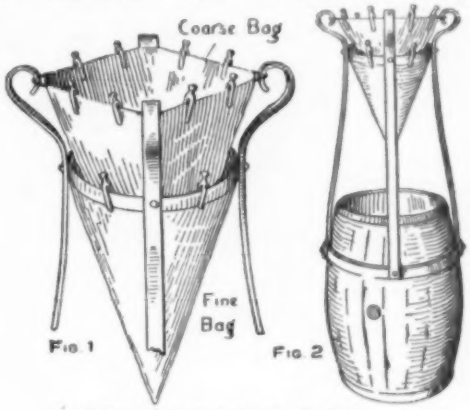
lower end of the window frame stile of the upper sash, or to slip in behind the outside shutters.

The shells will rest against the window sill. The holes G, used for extracting the milk, will serve to drain off the water when the plants are watered. Fill the shells with earth and set the plants in the same as an ordinary flower pot.—Contributed by Maurice Baudier, New Orleans, La.

Duplex Filter Holder Stand

The iron frame of an ice water cooler stand when inverted provides a way to hold a fine and a coarse cloth for filtering liquids.

The two filters may be used simultaneously, one being hung on a wire stretched through the loops of the feet,

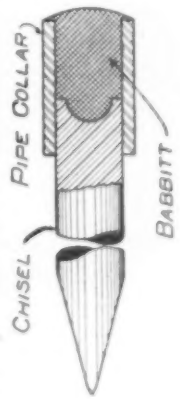


Filters Attached to the Stand

and the other on the circular iron brace a few inches above the feet. Both filter cloths are fastened with common wooden clothespins. Use the top wire for the coarse filter and the bottom one for the final straining, as shown in Fig. 1. The stand may be securely placed over the top of a cask, as shown in Fig. 2. This device saves time in handling liquids, as it filters twice at one pouring.—Contributed by Jas. M. Kane, Doylestown, Pa.

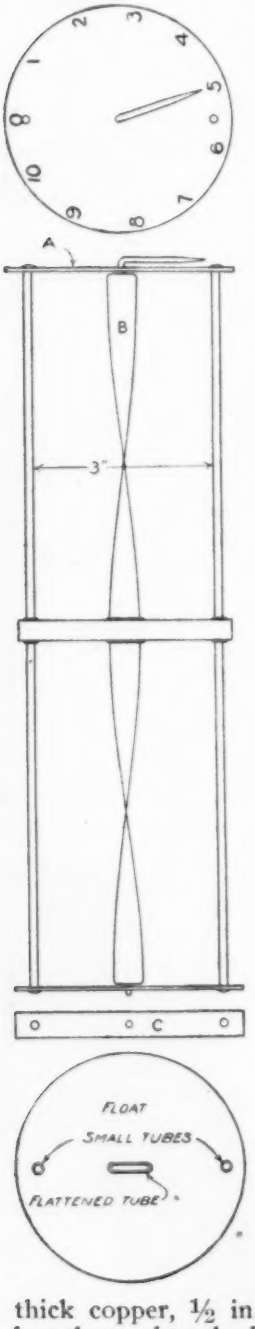
A Soft Head for a Cold Chisel

A new design of a cold chisel, that does not have the loud noisy click and the jar common to others, is shown in the accompanying sketch. Drill a hole in the head of the chisel, then drive a pipe collar over the end as shown and pour it full of lead or babbitt. This babbitt robs the chisel of the jar and does the work as well. A chisel fixed like this will stand some hard usage and when the babbitt is worn down, the collar can be refilled in a few minutes. —Contributed by H. C. Faber, Monongah, W. Va.



Gauge for Gasoline Tanks

The usual method of finding out how much gasoline a tank contains is to insert a stick, ruler or whatever happens to be handy that will go through the opening, and note the height the liquid dampens the wood. This is an uncertain method as gasoline evaporates rapidly. If a clean stick is not selected, particles of dirt are liable to be left in the liquid which will get into the carburetor and cause trouble.



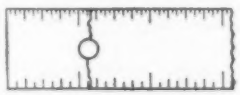
The accompanying sketch shows how to construct a gauge that will indicate the exact amount of gasoline in the tank at any time. From a piece of sheet brass cut three circular disks, two of them 3½ in. in diameter and the other 4 in. in diameter. Secure two brass rods $\frac{3}{16}$ in. in diameter and as long as the tank is deep and solder them to the larger brass disk A as shown in the sketch. Cut a strip of $\frac{1}{16}$-in. thick copper, ½ in. wide and with a length equal to the length of the wires, and twist it into one complete turn, making a spiral as shown at B. On one end of this spiral strip solder a piece of copper wire 1½ in. long and on the other end a piece about ¼ in. long.

The float is made of a strip of brass ½ in. wide and 5½ in. long, the ends of which are soldered together, forming a complete circle. The two smaller brass disks are soldered on the sides of this circle, making an airtight float. This float must have two brass tubes, slightly larger than the brass rods, soldered into it 3 in. apart, also, a flattened tube soldered in the center for the spiral strip to slide through freely. The air in the float must be at atmospheric pressure. This can be accomplished by drilling a small hole in the float and setting it on a cake of ice while soldering it up.

Drill a hole in the center of the disk A, large enough to admit the long copper wire on one end of the spiral strip, the end of which is bent over to make the pointer. Slide on the float. Cut a strip of brass, C, 1 in. wide, 3½ in. long and drill a hole in the center large enough for the copper wire, and solder it on the lower ends of the brass rods. Empty the gasoline tank and make a hole in the top 3⅝ in. in diameter. Put the gauge in the tank and solder around the disk A. Make a zero mark where the pointer stands, then put in 1 gal. of gasoline and make a figure 1, and so on until the tank is filled. The half gallons, or even quarts can be marked in the same way.—Contributed by Claude M. Sessions, Waynesville, Ill.

Mending Broken Celluloid Articles

Very often articles of celluloid or xylonite such as draftsmen's scales, curves, or triangles, are broken and discarded as useless. They can be mended very easily in the following manner: Immerse the broken parts in



ether until they soften, then apply a liberal application of collodion and press ends firmly together and keep them so by placing between two flat-irons heated to about 200 deg. F. Leave them in this position over night in a warm place so as to completely expel the ether and alcohol of the collodion. Trim off the surplus collodion and the result is a perfect and invisible joint. Be careful not to inhale much of the fumes from the ether and collodion and keep away from any open flame. The accompanying sketch shows a broken scale that was mended in this manner and is now as good as new.—Contributed by G. E. Kastengren, Seattle, Wash.

How to Make a Lead Coffin

The old-time method of making lead coffins was either to cast them in one piece and solder on the lid, or else to cast the sides, bottom, ends and lid in separate pieces and solder them together on the inside and lastly, when ready, solder the lid from the outside.

During recent years the coffin proper is lined in a manner similar to a sink or cistern and after the wood part has been placed inside, the lead cover is soldered at the outside edges.

Figure 1 shows a wood shell covered in the most common manner. Grooves are formed on the bottom against the outside angles, as shown in Fig. 2, and the center of all ends is also shown in

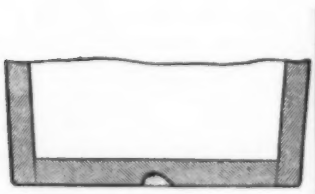


Fig. 1—Ordinary Method

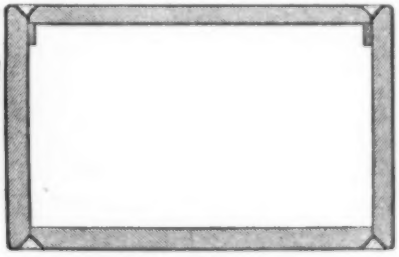


Fig. 2—Showing Grooves

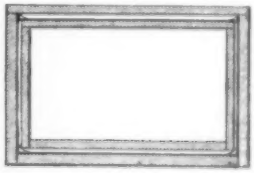


Fig. 3—Putting Cover On

Fig. 1. The bottom is in one piece and the edges are dressed into the grooves. The sides and half the ends are made in two other pieces and the edges also dressed into the grooves and bossed over the corners at the bottoms and at the ends, and the top is dressed over the edge of the shell and over a chamfered edge on the inside as shown in Fig. 2.

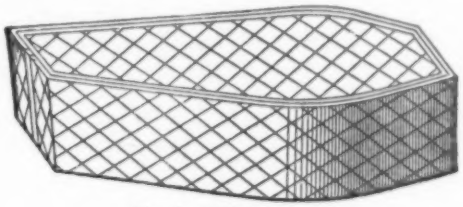


Fig. 4—Finished Coffin

The lead covering is usually cleaned and brightened with wire card. The lead is well chalked and then rubbed with a raw potato which, in combination with the chalk, prevents the solder from tinning beyond the edge of the shaving. The seam is then wiped flush in the ordinary way, the chalk washed off, and the whole surface scoured with a wire card.

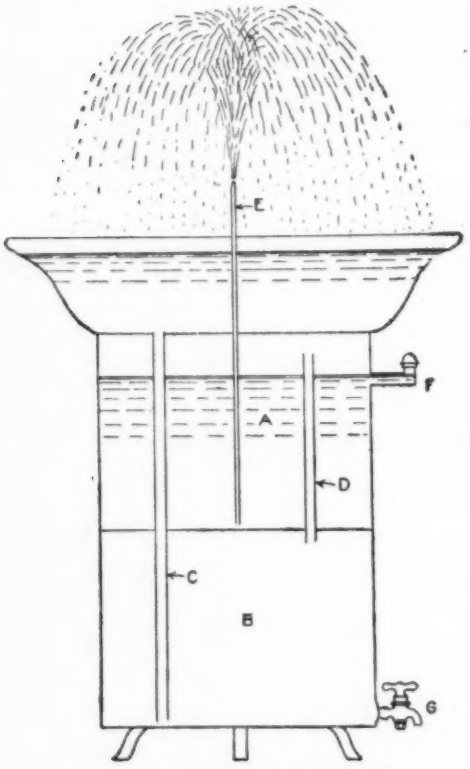
When the body is in the shell the lid is placed in position and the seam soldered flush, after which the lid of the outer case is screwed down.

The usual weight of the lead is from 5 to 6 lb. per foot and about ½ lb. of solder to the foot is generally sufficient.

When the outer case is lined with lead the shell is placed inside and as it does not fit tight to the sides of the case a supplementary wood lid is made to fit the case exactly, just below the top edge, then the lead cover is put on as shown in Fig. 3 and a seam wiped in the angle, the sides of the inner lining being left standing upright. Figure 4 represents the completed coffin.

Automatic Fountain

The fountain illustrated herewith is self-contained and works entirely by water and air pressure, both of which are supplied by its own tanks. The



Air Pressure Produces the Fountain

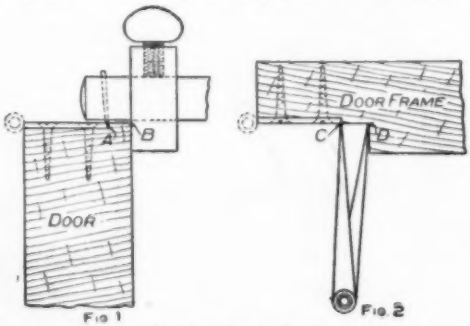
fountain will make a fine window display if it is provided with feet and set on a glass plate so it will be seen that no outside pressure is applied to it.

The main body of the fountain is a tank of about 10 gal. capacity which is divided into two separate compartments, A and B. These compartments are connected with ⅜-in. pipes, C and D, the pipe C extending through A and into the basin at the top. The tube E for the fount is a ⅛-in. pipe, tapering at the top end so as to make a fine spray of water. Be sure to solder all joints airtight. An opening, F, for filling and a drain cock, G, are soldered in the side of the tank as shown. The opening should have an airtight cover.

When the fountain is complete, fill the tank A up to the opening F and cover the latter. Pour some water into the basin and the fountain will begin its work. If properly constructed and all joints made perfectly airtight, the water will flow for about 6 hours.—Contributed by R. F. Wahl, Morrisonville, Ill.

The Right Way to Hang a Door

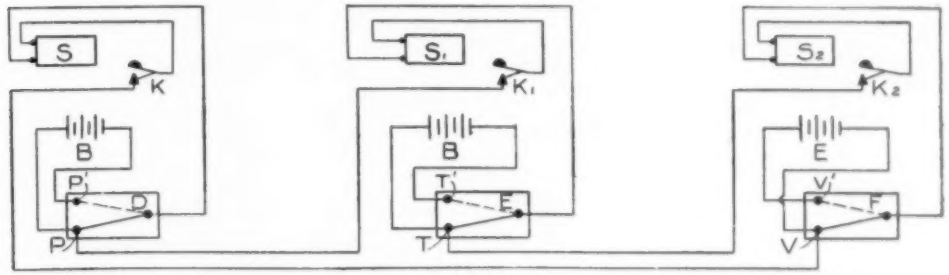
Many carpenters have considerable trouble in hanging doors so they will swing correctly at the first trial. A few simple rules are given here which if closely followed will give a successful result. When preparing to fit a door always turn the hollow side of the door towards the frame if possible. For varnished work fit the door so that a silver quarter-dollar will just slip in between the door and the frame on either side. For painted work a little more space should be allowed. Set your gauge at the proper distance (A-B) and always gauge from the frame side of the door as shown in Fig. 1. When the hinges are to be let into the door set your door in the opening, raise it to the proper height and mark with a knife the top and bottom of each hinge. Now set your compasses $\frac{1}{16}$ in. more than the gauge A-B, and scribe for the frame part of your hinge within the marks made with the knife at the top and bottom of each hinge, keeping one leg of the compass against the rabbet



Setting the Hinges

of the door frame, as shown in Fig. 2. Now cut out the frame and the door to a proper depth for the hinges accord-

ing to the marks just made. Fasten the top half of a hinge to the door to match the other half screwed to the top of the frame. Leave the whole hinge fastened to the bottom of the door. Set the door in place and connect the top hinge with the pin. Open the door to right angles with the frame and screw the lower hinge to the slot in the lower part of the frame and the door is hung. If these directions are carefully followed your door ought to swing just right the first time.—Contributed by Ed. A. Peacock, Cincinnati, O.



The Wiring Diagram

Using Dry Cells of Battery on a Telegraph Circuit

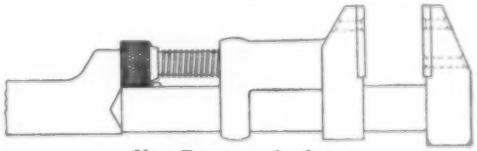
A new method of connecting a two-wire telegraph circuit so that dry cells of battery can be used instead of wet cells, is shown in the accompanying sketch. A telegraph circuit must be closed in order that one operator can call another. On this account wet cells are used in the ordinary circuit, as dry cells would deteriorate in a short time on a closed circuit and would have to be replaced frequently.

When the circuit is wired as shown in the sketch it is possible to use dry cells, and at the same time have a closed circuit when one operator wishes to call another. Double throw switches are shown in the diagram at D, E and F. S, S1 and S2 are the sounders and K, K1 and K2 are the keys of the respective operators, No. 1, No. 2 and No. 3. When the keys are closed, and the switches are in the position shown, there is no current flowing through the circuit. Suppose operator No. 3 wishes to send a message to operator No. 1, he simply throws his switch from position V to V1, opens his key (K2), and calls No. 1. After the message is sent, operator No. 3 closes his key and throws his switch to the former position. In this manner the current is flowing only during the time the message is being sent. In case one operator calls another and the current is weak the operator called can increase the flowing current by throwing his switch into the upper position.

Thus you can have a closed circuit and still use dry batteries. This method of wiring telegraph circuits has been tested and gives perfect satisfaction.—Contributed by Wm. S. McGraw, Blacksburg, Va.

Repairing Monkey Wrenches

Monkey wrenches that have the jaws badly worn or sprung can be repaired very easily in the following manner: File the faces of the jaws up true, cutting them back about 1/16 in. as shown in the accompanying sketch. Make two tool steel plates ⅛ in. thick that will just fit the depression filed out

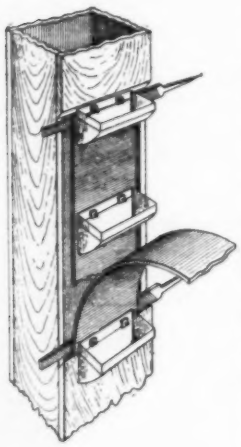


New Faces on the Jaws

and drill holes for rivets as shown. Harden the plates and then rivet them fast and you will have a wrench as good as new.—Contributed by R. Ench, Philadelphia, Pa.

Taking Slack from Elevator Belts

The slack in elevator belts may be removed with the use of two large files. The sketch illustrates the files in place and the belt apart, ready to have the slack taken out. Loosen the set screw in the pulley at the head of the elevator, remove the door from the elevator leg, and pull the belt around until you have the splice at the opening. Hang the first cup below the splice in the belt out over the leg cap at the bottom of the door, place the file back of the cup and belt, across the leg, letting the file rest on the fillers as shown. Take hold of the belt and pull down, taking out all the slack you can, says a correspondent of American Miller.



The second or third cup above the splice will come out at the top of the door, depending on how much slack there is in the belt. Hang the top edge of the cup on the leg cap at the top of the door and place the other file at the back of the cup and belt across the leg, letting it rest on the fillers as before. The belt will now be tight and fastened with the files. Open up the splice, cut out the slack, and fasten back with the bolts in the usual way, pull out the files and the cup will jump back into place. The reason for using the files is that they are rough and will not slip.

Another Way to Repair a Cracked Water Jacket

Place the cylinder over a basin and stop the water inlet at the bottom with a plug of some kind. The water space is now filled with a slightly concentrated solution of sulphate of copper through the water outlet at the top of the cylinder. At first the solution will rapidly leak through the crack and must necessarily be dipped up and poured through the top opening again. After repeating this operation a few times, the leakage will begin to slow up and will be gradually reduced to a sweating, and this will cease at last. Allow the solution to remain in the jacket about a day, and the repair will be permanent.—Contributed by W. O. Hay, Camden, S. C.

A Water Monoplane

Standing on a monoplane which is rapidly towed after a motorboat is a thrilling pastime for the bather. If he

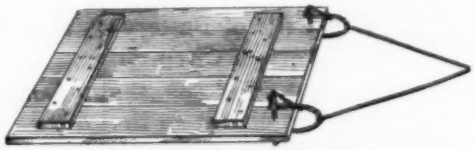


Fig. 1—The Water Monoplane

stands well back on the rear part of the boards, the plane will glide along on the surface of the water, a step or two forward will cause it to go beneath the surface and he will be passing through knee-deep water. The water monoplane while traveling at a rapid speed is a hard thing to keep right side up and for the rider to keep on board.

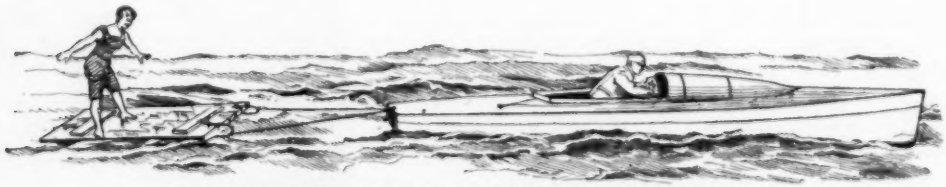


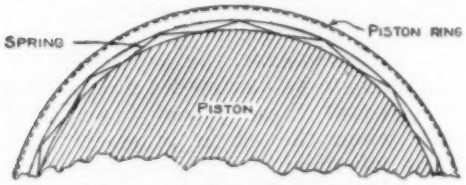
Fig. 2—Sticking to the Plane as It Is Towed Behind a Boat

The plane is made by nailing two cleats across several boards and attaching two clevises at one end as shown in Fig. 1. The manner of riding on board is shown in Fig. 2.

Method of Expanding Worn Piston Rings

Some one has suggested as a remedy for worn piston rings on a gasoline engine when new rings are not at hand, to slip a corset steel under each ring so as to expand it.

In some cases the foregoing plan will not work with success, but if you use a corset steel the same width as the ring and bend the steel every inch so as to make it look like an old-fashioned rail fence and then insert it under the ring it will give expanding pressure every 2 in. This is a successful remedy for worn piston rings in every instance where the bent steel springs are applied.—Contributed by X. D. Johnson, Merna, Nebr.

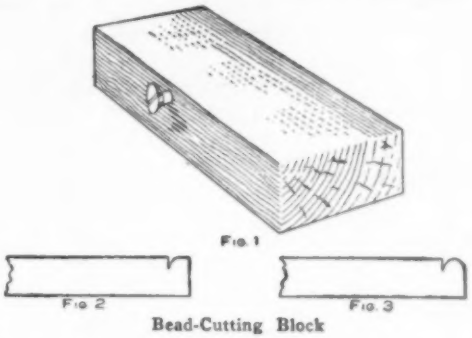


Bent Steel Under the Piston Ring

A Home-Made Bead Plane

A bead plane is not always necessary when a bead is required on the edge of one or two boards. A simple device for making a bead of any width is shown in Fig. 1. Secure a small block of wood and place an ordinary flat-headed wood screw near the end and top edge of one side and screw it into the wood until the head projects the distance equal to the size of the bead wanted, leaving the slot in the angle as shown.

Place the block against the edge of the board where the bead is wanted and draw it toward you, the head of the screw will make a groove as shown in Fig. 2. Take a piece of sandpaper or a plane and round off the outside corner and this will leave a finished bead, Fig. 3, equal to that done with an ordinary beading plane.

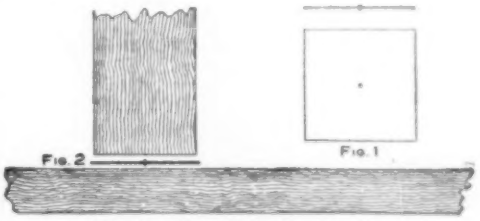


Bead-Cutting Block

The bead can be varied in width by simply turning the screw in or out, and larger or smaller beads can be formed by using larger or smaller screws.—Contributed by W. Arthur Mitchell, Newburgh, N. Y.

Tool for Marking Dowel Holes

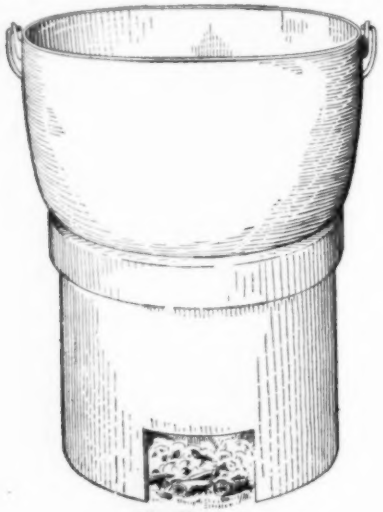
On some work it is quite difficult to locate the exact point for a dowel, but with the tool illustrated placed between the joint to be made and the parts gently pressed together you have the exact point for the dowel in each piece. The tool is made from a piece of sheet steel about ½ in. square with a pin having a point on both ends driven in the center, as shown in Fig. 1. The tool is placed between the pieces that are to be joined, as shown in Fig. 2. The small pin will mark the point for the bit in both pieces exactly opposite.—Contributed by Chester Purdy, Ghent, O.



Marking Bore Holes for Dowels

Outdoor Fireplace for a Kettle

When a kettle is used in the open air for heating water, or boiling maple syrup, there is considerable of the heat



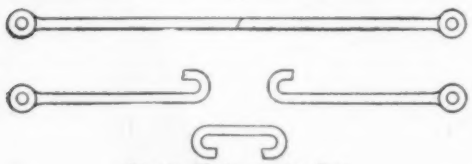
Tile Furnace

wasted, unless a furnace of some kind is built about the fire. The accompanying sketch illustrates a furnace made of an ordinary drain or sewer tile. The diameter of the tile must be of such a size as to let the largest part of the rounding bottom set inside. Dig out a hole in the earth under the tile or break a piece out of the tile to make an opening to feed the fire and for the draft.—Contributed by Oscar Seegmiller, Walkerton, Can.

A Quick Repair for a Broken Steering Gear Rod

[Condensed from American Marine Engineer]

One of the large list of accidents which can occur on board a vessel and which has to be repaired with as little



Hooks Made on the Rod

loss of time as possible, and with the means available on board ship, is the fracture of one of the rods of iron connected by chains to the steering gear and rudder head. These are liable to break off if the boat happens to be caught by a heavy sea, owing to the immense strain which is put upon the surfaces of the rudder and transmitted through the link work to the steering gear, which at the moment of impact can be considered as a rigid point of fixture for the link work. A very simple way to repair such a breakdown is as follows:

The broken rod should be taken out and the ends of the broken parts heated in the boiler fire; they can then be easily bent into a hook shape, as shown in the sketch. The rod will now be short of its proper length by anything from 8 in. to 12 in., and this gap must be filled in either with a few links of chain or shackles or else by another piece of rod whose ends are bent as shown in the sketch, to fit in the hooks formed in the steering rod. In the latter case, the ends of the rod will have to be hammered over in order to prevent these pieces from falling out when the chain is slack. This form of repair is recommended inasmuch as it does away with welding, and not only does it form a quicker job but as a rule sufficient heat cannot be obtained at the moment to make a good weld, and the trouble might very easily be repeated when it is least desired.

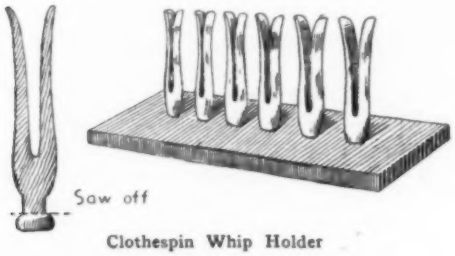
How to Make Tortoise-Shell Japan Surface

Boil together ½ lb. umber and 1 gal. of good linseed oil until the mixture becomes very brown and thick, then strain through a coarse cloth, after which continue to boil until it becomes of the consistency of pitch, when the mixture is ready for use. Clean the surface to be japanned and lay vermilion mixed with shellac varnish or drying oil very thinly diluted in oil of turpentine. When the vermilion becomes dry, brush the surface over with the first prepared mixture thinned in oil

of turpentine and when it sets, put the article in a stove or japanning oven where a strong heat may be applied and continued for some time. Several days or a week will be better for the baking.—Contributed by A. E. Johnson, Frankfort, Ind.

Home-Made Carriage Whip Holder

Take a piece of board 3 in. wide and 12 in. long and bore several holes in it as large as a wooden clothespin at the place just below the knob; saw off the knobs and fill the holes with pins as shown in the illustration. Nail the board up in your carriage house and

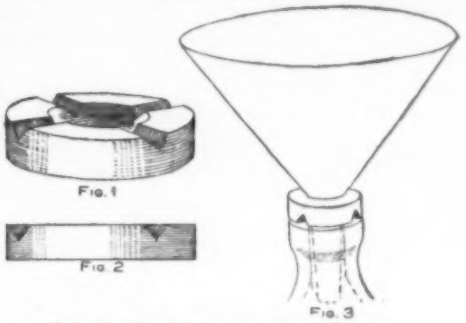


Clothespin Whip Holder

you will have a fine whip holder. If the pins are placed so they will touch each other, you cannot miss one when you make a strike to hang up the whip. —Contributed by R. H. Workman, Loudonville, Ohio.

Venting Washer for a Funnel

If the stem end of a funnel—especially those of glass—fits tightly in the necks of bottles it will not allow the air to escape freely while the liquid is running through, consequently the operation of pouring is rather slow. When filtering, the same trouble exists. The device shown in the accompanying sketch will remedy this fault. A section of a rubber garden hose or steam hose is cut so as to make grooves as shown in Figs. 1 and 2. Slip this rubber washer over the neck of the funnel with the grooved side next to the bottle, Fig. 3. This will elevate the funnel so as to form a free space between the stem of the funnel and the inside of the bottle neck to allow the escape of air through the grooves. This washer also prevents the funnel jam-

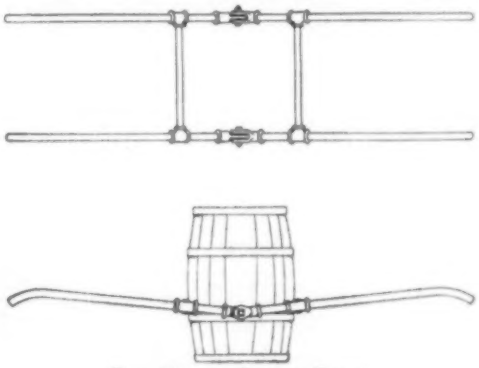


The Washer Allows the Air to Escape

ming into the neck of the bottle so tight that it is difficult to remove.—Contributed by James M. Kane, Doylestown, Pa.

Handles for Carrying a Barrel

A barrel when full is not an easy thing to handle even by two men. The shape of a barrel does not offer any part for a person to take hold and walk with ease. In order to provide a way to handle a large number of filled barrels in the easiest way possible I made a device as shown in the illustration, from pipe and fittings. The two hinge joints were made especially for this purpose. The handles are slipped over the barrel and then lifted by a person at each end. The lifting of the ends

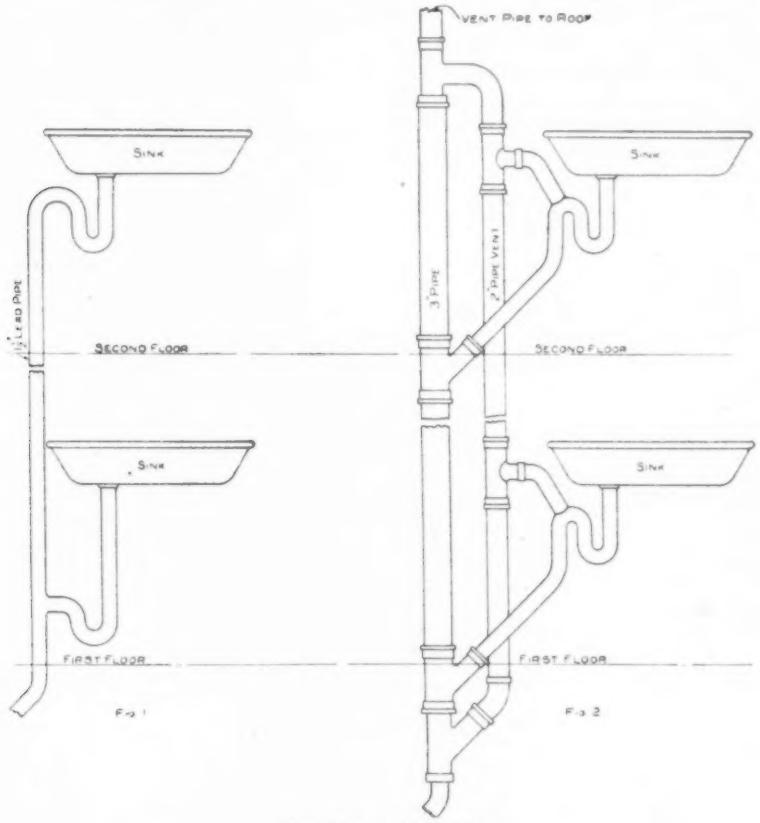


Easy Way to Carry a Barrel

will cause the hinged joints to bend, thus bringing the two cross bars together on the barrel.—Contributed by Oscar Lewis, Oshkosh, Wis.

Old and New Style Plumbing

There is possibly no branch of construction work which has undergone within the same given time such great changes of a far-reaching nature as plumbing construction. These changes look to the betterment of sanitary conditions and are going on all the time. This fact is illustrated in the accompanying sketch which shows a comparison between the methods employed several years ago and those of today. Figure 1 is a sketch of a job that was done twenty years ago, which never worked well and was always air-bound. The board of health ordered it changed and Fig. 2 shows the modern method of doing the same job. The vent and back-airing pipes are so arranged that sewer gas cannot enter the house.—Contributed by George M. Crawley, Jr., Newark, N. J.



Two Styles of Plumbing

Bonding New to Old Concrete

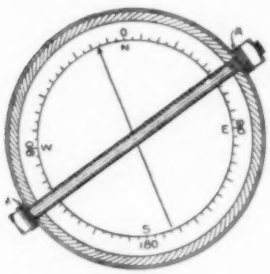
A description of how to make connections of new to old concrete after a lapse of 24 hours or more is given in a recent paper read before the American Society of Civil Engineers. The article states that the old surface concrete is broken back to firm material and the fresh surface cleaned with steam, air blast or forceful water streams, so as to remove all fine loose material. The surface should be well saturated, but not so much that the water will stand in places, or ooze from the material. This is painted completely with neat cement grout, mixed to the consistency of thin cream which must be put on just before the new concrete is deposited. Be sure that the new concrete is of the proper mixture, containing a proper proportion of mortar, which should be worked against

the joint so as to be certain that no voids exist in its vicinity.

When making connections after long intervals, so long that the old cement has set hard, and where the expense of rough pointing the whole surface is too great, use commercial muriatic acid, diluted with clear water, 1 to 5, or the commercial bonding powders, dissolved in clear water at the rate of 5 lb. of powder to 10 gal. water. Wet the old concrete surface with so much water that a fresh wetting is not immediately absorbed. Remove the excess moisture, and, when the surface appears as if commencing to dry, paint on the old surface three successive coats of acid one after the other. Allow this to remain about 30 minutes, after which carefully clean the surface of unspent acid, soluble salts, and fine material with plenty of water, finally cleaning with a steam jet or air blast, if obtainable. While the old material is very damp apply the neat cement and concrete as in the first case.

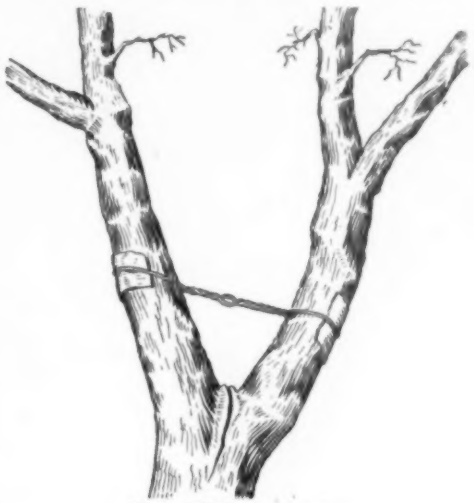
A Substitute Tool for Removing a Bezel Ring from a Transit

A bezel ring on a transit had become so badly corroded that it was too tight to unscrew by hand and as there was no tool for the purpose at hand the following method was used. A ¼-in. bolt ½ in. longer than the diameter of the bezel ring was secured, also two wrought-iron washers. Two sheet packing washers, A, were then put under the iron ones and the whole clamped on the bezel ring as shown in the accompanying sketch. By turning the ring, using the bolt as a handle, it was easily removed without injury to the surface or strain on the instrument. —Contributed by J. W. Wheeler, Cambria, Wyo.



Repairing a Split Tree

When a tree splits at the crotch, or shows a tendency to do so, it may be bolted together; but getting a bolt of the right length and putting it in neatly often involves considerable trouble, says the American Thresherman. A much neater, more effective, easier, and cheaper method is to use a stout wire, as shown in the accompanying sketch.



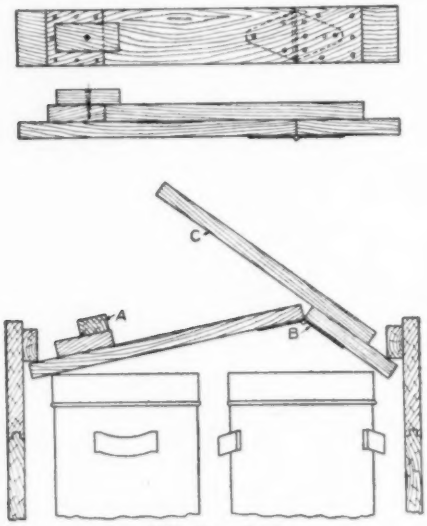
Limbs Tied with a Wire

One hole is bored through one branch of a tree, while two, close together, are made in the other. These should be small enough so that the wire will fit closely. The wire, cut amply long, is pushed half its length through the single hole. The ends are then put through the two holes in the other branch; and each is so bent as to come under the wire as shown. Any convenient bolt, strong stick or bit of iron bar is then used to twist the two strands together, thus drawing the two branches to the required position and holding them there. A year's growth is usually ample to cover all the wire except the connecting part. Of course the ends of the wire must be trimmed off as soon as they are secure.

Excessive sprinkling of the floor of a varnish room will cause trouble in varnishing.

How to Hold Milk Cans in a Cooling Box

The usual practice of small dairymen to keep their milk cool is to put the milk cans under running water in a box. The cans are usually kept beneath the water by slipping strips of board, of proper length, over the tops of the cans and under ledges at the side of the box. In using this method one runs the risk of upsetting the cans when putting the strips in position. An improvement over this method is shown in the accompanying sketch which is self-explanatory. The apparatus is made of strips of board, 1 in. thick. The lower sketch shows how the device is put into the milk box. B is a hinge and A is a button to lock the tongue C in place when the device is straightened out. Boards for holding grain in bins can be made in the same manner.—Contributed by H. G. W.



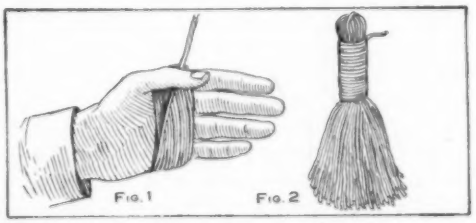
Milk Box Cover

How to Straighten Dished Circular Saws

A number of 30-in. circular saws of No. 10 gauge stock in some way became dished or saucer shaped so much that the teeth were about 2 in. out of the plane of the center. The saws were placed one at a time on a perfectly flat surface with the concave side down and a heated circular piece of cast iron weighing about 4 lb. set on the center. The center would draw down flat in a few minutes and then the iron was removed. One thing was noticed that when the heated iron was left on after the saw had drawn down flat, it would bow up or dish again on the opposite side and leave the concave on the upper side. This method may be applied in many cases; for instance, slender pieces which have warped in handling so as to seem entirely of no use may be quickly and accurately straightened by laying on a hot plate with a heated piece on top of them.—Contributed by Donald A. Hampson, Middletown, New York.

Home-Made Paint Brush

"Necessity is the mother of invention", so when I wanted a paint brush and could not find one at hand, I proceeded to make one and was surprised at the good results obtained. I wound some binder twine in a coil about my hand as shown in the sketch. After removing the coil from my hand I wound more twine tightly around one-half of the coil, thus forming a handle for the brush and leaving the other half for the brush part. I then cut the brush end off square and combed out all the loose ends and the brush was complete. This brush was excellent for rough work and did fine work with surprisingly good results. The length of the handle part and the length and breadth of the brush can be modified to suit the purpose for which it is intended.—Contributed by John A. Long, Walkerton, Can.

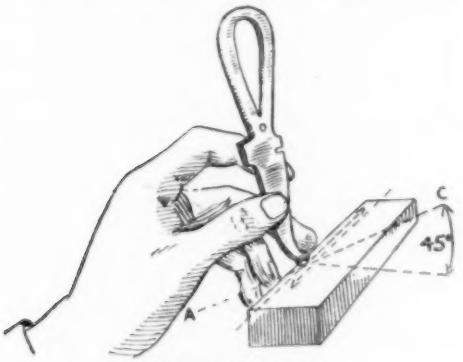


Brush Made from Rope Fiber

How to Cut Glass with a Steel Wheel Cutter

A cheap glass cutter with a cast-iron handle, and a small steel cutter will work nicely for the first one or two times, but the edge on the tool soon becomes dull and a good cut cannot be made. The wheel must be sharpened frequently in order to obtain good results. The sharpening may be easily accomplished in the following manner: Take the cutter in your hand and hold it against an oilstone. The little wheel should stand in the direction of the line AC. If the hand is now moved forward and backward along the edge of the stone, the wheel will rotate, thus honing the cutting edge. The wheel should be kept sharp for good results.

A glass plate should be cut on both sides with the cuts exactly opposite, before attempting to break the glass. Then start on one edge and tap lightly



Honing the Wheel

along the cut until you see the glass break for a short distance and follow the whole line in this manner. The glass now can be easily separated without breaking it.—Contributed by Max Lange, Hartford, Conn.

A Pneumatic Rocker for Chairs

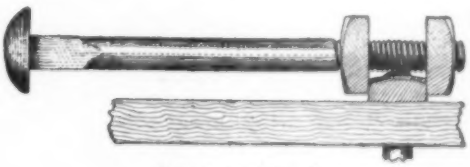
The bottom edges of both rockers are planed or chiseled out to fit the curvature of a pneumatic bicycle tire. A hole is bored in the rear end of each rocker for the valve stem. The front end of each rocker is fitted with a small bolt for holding the tire in place. If a single tube tire is used a length is cut out as long as the chair rocker and the ends stitched over and vulcanized so as to hold the air pressure.

Pneumatic Rockers

A double-tube tire can be used in the same manner. The casing is cut and each end is made as a "dead end" in the vulcanizer. An inner tube can be put in and lapped over at each end. A short slit, cut on the inside of the casing near the ends, will provide a way to place the inner tube in quickly. The slits are laced up the same as a bicycle tire.—Contributed by W. S. Jacobs, Malden, Mass.

Substitute for a Wrench

If in need of a wrench and one is not at hand, take a large bolt and run on two nuts, allowing a space between them to fit over the nut to be turned. This will make a serviceable wrench, a

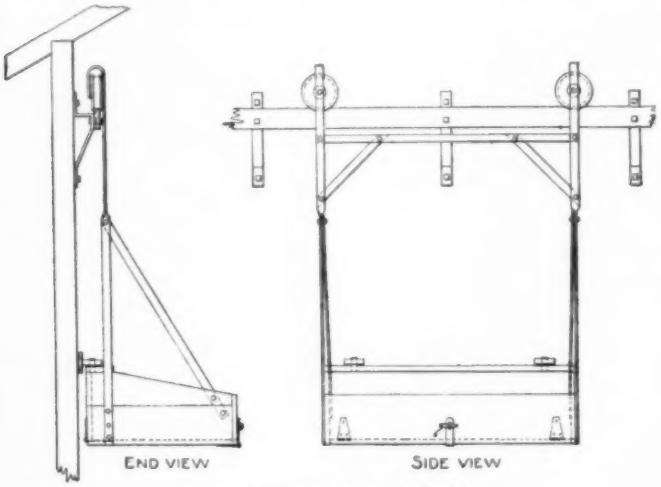


Substitute Wrench

substitute that will prove very beneficial in case of an emergency.—Contributed by Thos. L. Parker, Olaf, Iowa.

Keeping Light Castings Straight

Some methods used to keep light castings straight are barring the casting, cooling with water and clamping the casting fast. Some have tried ramming the sand over the casting on the part that warps. These methods have been found to be very fallible, as barring the casting often brings it higher than is wanted, using water cracks it, clamping will hardly hold at all, while ramming the sand hard does not serve any better for the reason that the sand dries, thus lessening its ability to hold the casting down, says the Obermayer Bulletin. In foundries where a suggestion is taken and tried they have found that the following method, if used properly and with judgment, will invariably give satisfaction.



Grooved Wheels Carry the Load

Lay a strip on the board with pattern of equal length and cast with the piece. Do not disturb the bed until thoroughly cooled. The aim of the strip is to be of sufficient weight to give all points of the casting equal heat, so that when it cools it will all cool equally.

If the casting is square, or nearly so, the cope sand can be left on and a groove or gutter scratched in it, diagonally from the corners, and these filled with iron. In this method omit the strip, as the iron over the top gives the center and sides the equal heat desired.

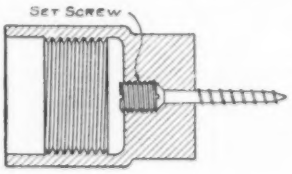
Manure Carrier for a Barn

The manure, damp straw and refuse from the stalls of cattle and horses are usually taken out of a barn in a wheelbarrow. Instead of using a wheelbarrow I made a carrier that has been in service for eight years and I find it a much better way to handle the material. The tracks I made from old wagon tire iron, the upper one being supported by brackets 2 or 3 in. out from the wall, and the lower one fastened directly to the studs. Two grooved wheels at the top, hung similar to barn door wheels, carry the weight of the load, while two flat-faced wheels, placed on vertical axles and running against the side of the lower track guide the lower part of the carrier. The box is made from 1-in. boards and the bottom attached with hinges and a catch so the contents can be emptied at will.

A chain or rope is fastened to the metal bars near the top which has sufficient length for a person to take hold and draw the carrier along the track.—Contributed by John Howard Miller, Thebes, Ill.

Improved Screw Chuck for Wood Turning Lathe

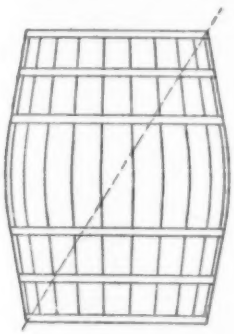
Wood-workers and pattern makers will be interested in this new scheme for holding the wood screw in a wood turning lathe chuck as shown in the accompanying sketch. The trouble with most chucks of this kind is that the wood screw is held in such a manner that it is almost impossible to remove it to replace with a



new one. In the one here shown a hole is drilled and countersunk for the wood screw, then it is tapped out and a set screw put in above the head of the wood screw to hold it in place, as shown. The set screw can be a piece of ordinary bolt sawed off to fit, and a slot cut in it with a saw so that it can be turned in or out with an ordinary screw driver.—W. W.

How to Determine a Half-Filled Barrel of Liquid

The accompanying illustration shows a simple way to find out when a barrel is half full of any liquid. Carefully tilt the barrel until the surface of the liquid is on a level with the dotted line shown in the sketch. If the liquid comes exactly to the line the barrel is half full.—Contributed by S. W. Halbert, Jr., Augusta, Wis.

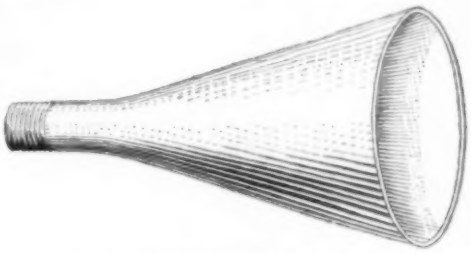


Under-Water Exhaust Heads for Motorboats

The law in several states requires the exhaust from motorboats to pass under water or have the engine equipped with an efficient muffler. This will decrease the power to some extent in either case, but the elimination of the noise adds much to the pleasure of motorboating.

The accompanying sketch shows an exhaust head connection for use under water, which not only does away with the noise, but actually increases the power. The expanding funnel provides a way to form a vacuum that will draw the escaping gases away from the exhaust valve, thus preventing any back pressure.

The funnel can be made from a casting by boring it out and threading the small end, or it can be made by riveting a sheet-metal funnel into a short length of pipe. In either case care should be taken to have the throat as



Funnel-Shaped Under-Water Exhaust

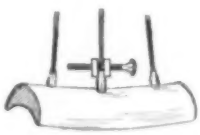
smooth as possible, and to avoid all sharp angles and turns as they cause loss in efficiency.

The exact dimensions of a funnel to give the best results in any one particular case can only be determined by experimenting, as they will vary with the type of boat and engine used. The exhaust pipe from the engine should lead out of the stern of the boat and should be at such a point that the funnel will be submerged at all times. The funnel should point dead astern, as in that position the rush of the water passing it causes the vacuum in the opening.

This under-water exhaust is similar to all other types in one respect, viz: the engine must be started with an open exhaust and the boat put well under way before turning the exhaust into the under-water pipes.—Contributed by Howard M. Nichols, Kenyon, Rhode Island.

Emergency Bicycle Nipple Wrench

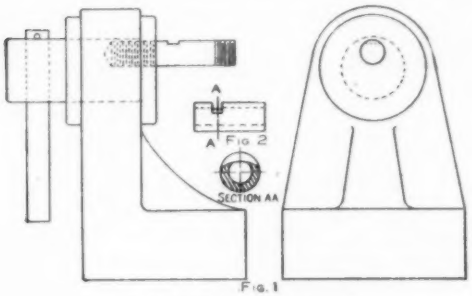
When you want to replace a few broken spokes in a bicycle wheel take a small bolt, a stove bolt will do, and run two nuts on the threads. Adjust the nuts so they will fit over the flattened part of the nipple, as shown in the sketch, and you can tighten the spokes as well as if you had a regular nipple wrench.—Contributed by Thos. DeLoof, Grand Rapids, Mich.



A Tool for Cutting Oil Ring Grooves

A very handy little device for cutting the oil ring grooves in the bearing bushings of small motors and engines is shown in Fig. 1.

The device consists of a stud, off-

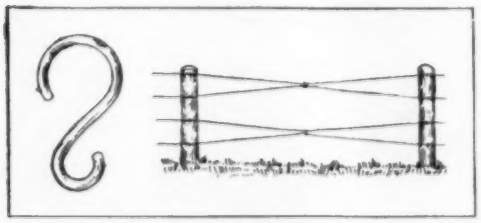


Cuts a Curved Groove

centered, and screwed to the circular body with the flange. The bearing, of bronze, is shown in Fig. 2. This is slid on over the stud and a nut screwed on to hold it solid. The whole is clamped on the bed of a hand milling machine. A circular saw cutter having a face width equal to the width of the cut required is fastened on the spindle of the machine. The small handle on the device is swung up until it is parallel with the milling machine bed. Then the bed is run up under the saw; the small handle is given a throw to the right and one to the left and a cut is made as shown in section AA.—Contributed by J. H. Crawford, Schenectady, N. Y.

Wire Fence Hook for Hunters

When a person goes hunting he must occasionally climb or crawl through a

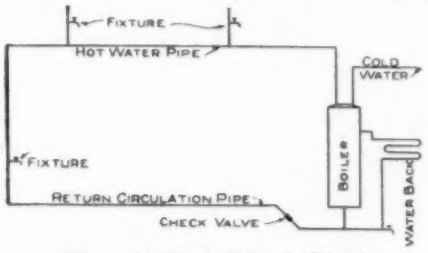


Hooking the Wires Together

wire fence at the risk of tearing his clothes. The little device illustrated in the enlarged portion of the sketch is a hook made from a heavy piece of wire similar in shape to a letter S. This is very simple, but practical when two of them are applied to the wires of a fence as shown in the other part of the sketch. —Contributed by Frank Evans, Detroit, Mich.

Preventing Back Circulation in Water Pipes

In buildings where the hot water pipes are returned to the bottom of the boiler to form a circulation system, it sometimes happens that fixtures located at the end of a hot water run will draw their supply through this return pipe, thus securing a supply of cold or lukewarm water instead of hot water.



Where the Check Valve Is Placed

A good method to prevent this is to place a horizontal check valve in the return pipe close to the boiler and inclined at an angle of 45 deg. from the horizontal, as shown in the accompanying sketch. This will secure a positive action without retarding the return flow of the water to the boiler. —Contributed by Geo. R. Evans, Berkeley, Cal.

Shears for Cutting Rubber or Sheeting

According to a correspondent of the Scientific American, a very handy tool can be made from an old pair of scissors or shears by cutting one blade with a set of saw teeth inclined toward the handle. These teeth hold the material fast, and prevent it slipping toward the point of the shears. Rubber sheeting, strips and all kinds of soft packing can be easily cut with square or inclined ends.

How to Remove Glass Stoppers from Bottles

Glass stoppers which are stuck in bottles may be quickly removed by holding the bottle at a slant of about 45 deg. and applying a burning match to the neck of the bottle around where the stopper seems the tightest and turning the bottle while the match is burning so the glass will be heated evenly all around. This will cause the neck of the bottle to expand before the stopper does and when the flame has well burned out, drop the match and quickly give the stopper a little twist and it will come out readily.—Contributed by Jno. E. Cox, Halstead, Kansas.

A Garage Auto Jack

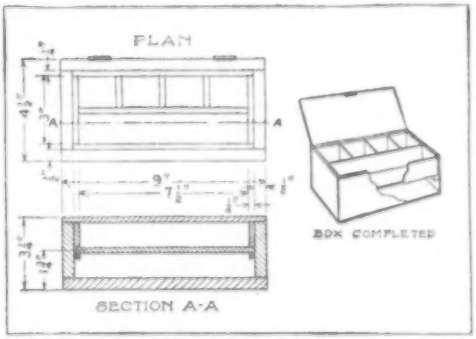
A simple and effective wagon or automobile jack is illustrated in the accompanying sketch. With this jack both front or rear wheels can be raised from the floor in less time than it takes to tell about it, says Motor Age. The jack can be easily and quickly applied without the necessity of the operator crouching down under the car. By simply placing the jaws against the axle and pressing the handle down to the ground the wheels are lifted and securely held up while repairs, adjustments or replacements are being made on the wheels, brakes or tires; all that is necessary to do to let the car down on the floor again is to raise the handle; either one of the wheels, or both, may be raised by engaging one or both of the jaws; the leverage obtained from the long handle makes its operation comparatively free from physical exertion; it is not apt to be carried away unintentionally or otherwise; nor is it liable to be misplaced. It has no moving parts other than the rollers; and the cost of its construction is little more than the price of a jack of the regular type. The long U-shaped handle is made from a single ¾-in. pipe, the open ends of which are slipped over one arm of each of the bell-cranks. The bell-cranks are wrought-iron forgings, and are firmly attached to the axle, which is supported by cast-iron rollers

Lifts an Axle by One Movement

on either side. To prevent the jaws from scratching the paint, it is well to wrap them with rope, tape or cloth.

A Draftsman's Tool Box

A handy little case that provides a place for the instruments used by architects and draftsmen can be made along the lines of an ordinary mechanic's tool chest. The accompanying detailed drawing gives the dimensions to construct a proper sized box. As this is a

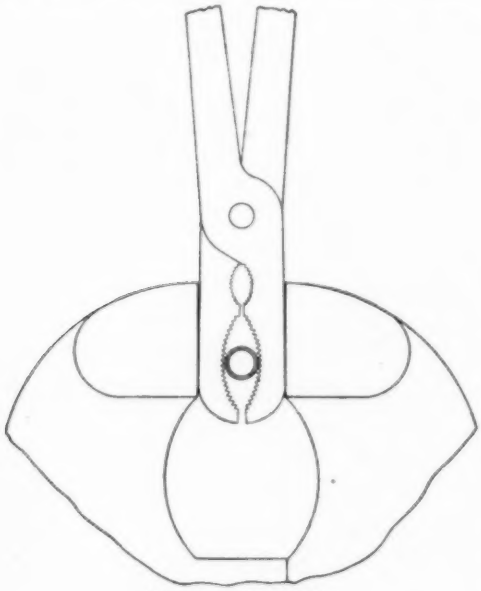


Details of the Box

small box, it can be made of the best material and highly finished.—Contributed by R. M. Dunkle, Chicago.

An Improvised Pipe Vise

The writer had a job of pipe fitting to do some time ago where there was no pipe vise available. The accom-

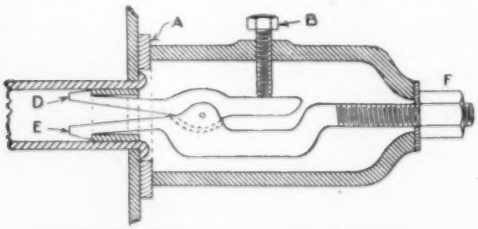


Emergency Pipe Vise

panying sketch shows how one was made out of an ordinary pair of pipe pliers and a machinist's vise and it answered the purpose as well as the regular tool.—Contributed by M. J. Johnson, Appleton, Wis.

A Boiler Tube Ferrule Extractor

The boiler tube ferrule extractor illustrated herewith is being used in a number of shops, says the American



Adjusted to Various Boiler Tube Sizes

Machinist. The tool has the advantage of being capable of some adjustment for use in various sizes of boiler tubes.

In using the ferrule extractor shown in the sketch, a hardened steel washer, A, is first placed against the tube plate, the setscrew B being slackened to allow the jaws DE to enter. When all are in position, the setscrew B is advanced far enough to press the jaws of the extractor tight against the sides of the boiler tube; the nut F is then turned with a wrench and the ferrule gradually drawn out.

Hints for the Amateur Automobile Repairman

Do not try to screw a nut down too tight, you are liable to strip the thread. In tightening the nuts which hold down the cylinders, or secure the bottom half of the crankcase to the upper half, or in any case where several nuts and studs are employed, be sure that a good firm contact is obtained between the surfaces to be drawn together before the nuts are drawn up. The nuts should be drawn up evenly all around, says Motor Age. Don't draw one nut down tight, then proceed to the next one, for if you do, the chances are that you will break off a lug. When packing is used, paste it to one half—the stationary part preferred—using shellac when the connection must be oil-tight and white lead where a watertight union is desired. A fold in the packing when the parts are drawn up tight will be the cause of a broken case or cylinder, or at least a leaky joint. Don't use a pipe wrench or a pair of pliers to tighten a nut if a plain jaw wrench is at hand, and avoid the use of a wrench whose jaws are too large to fit the nut. In making a gasket for a flange on the water, or gas piping, be sure to cut out the hole in the middle; blind gaskets are very detrimental to the successful operation of a motor. Whatever you do go easy, and try to make up your mind why and how you are going to do it.

When the safety valve blows off, compare it with the steam gauge. If they do not agree, find out which is incorrect.

AMATEUR MECHANICS

Home-Made Snowshoes

Secure four light barrel staves and sandpaper the outsides smooth. Take two old shoes that are extra large and cut off the tops and heels so as to leave only the toe covering fastened to the sole. Purchase two long book straps and cut them in two in the middle and fasten the ends on the toe covering as shown in Fig. 1. The straps are used to attach the snowshoe to the regular shoe. When buckling up the straps be sure to leave them loose enough for the foot to work freely, Fig. 2. Fasten the barrel staves in pairs leaving a space of 4 in. between them, as shown in Fig. 3, with thin strips of wood. Nail the old shoe soles to crosspieces placed one-

FIG. 1

FIG. 2

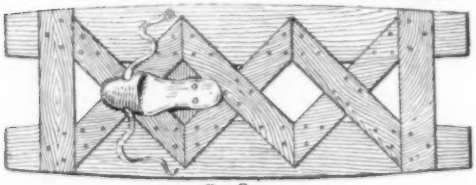


FIG. 3

Made from Barrel Staves

third of the way from one end as shown. —Contributed by David Brown, Kansas City, Mo.

A Velocipede Racer

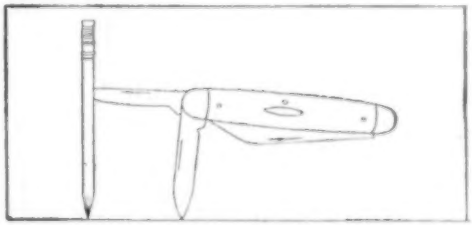
The small boy shown in the accompanying illustration found a way to make a new plaything out of his old one. When he became tired of his old-fashioned velocipede and thought he would prefer a "racing automobile" he simply disconnected the front wheel and the fork from the rear wheels by removing the bolt. The back part of the machine was turned upside down

Racing Auto

and the bolt replaced to join the two parts. The saddle, which had been previously removed, was then attached to the rear axle with a piece of wire and the "racer" was ready for use.—Contributed by C. L. Edholm, Los Angeles, California.

A Substitute for a Compass

An easy way to make a pencil compass when one is not at hand, is to take a knife with two blades at one end, open one to the full extent and the other only one-half way. Stick the point end of the full open blade into the side of a lead pencil and use the half-open blade as the center leg of the compass. Turn

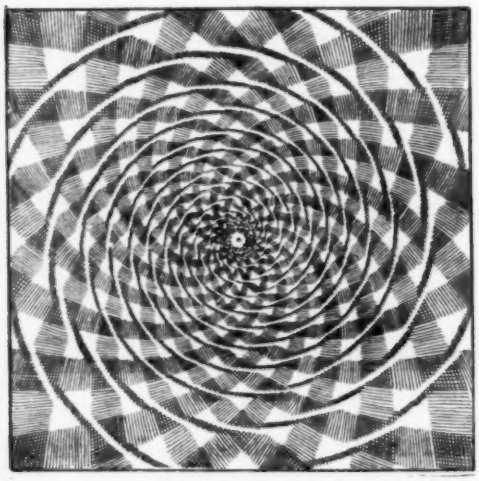


Pencil on the Knife Blade

with the knife handle to make the circle. —Contributed by E. E. Gold, Jr., Victor, Colo.

Another Optical Illusion

After taking a look at the accompanying illustration you will be positive that the cords shown run in a spiral toward the center, yet it shows a series of per-



The Cord Is Not a Spiral

fect circles of cords placed one inside the other. You can test this for yourself in a moment with a pair of compasses, or, still more simply, by laying a point of a pencil on any part of the cord and following it round. Instead of approaching or receding from the center in a continuous line, as in the case of a spiral, you will find the pencil returning to the point from which it started.

Substitute for Insulating Cleats

In wiring up door bells, alarms and telephones, as well as experimental work the use of common felt gun wads make a very good cleat for the wires. They are used in the manner illustrated in the accompanying sketch. The insulated wire is placed between two wads and fastened with two nails or screws. If one wad on the back is not thick enough to keep the wire away from the support, put on two wads behind and one in front of the wire and fasten in the same manner as described.

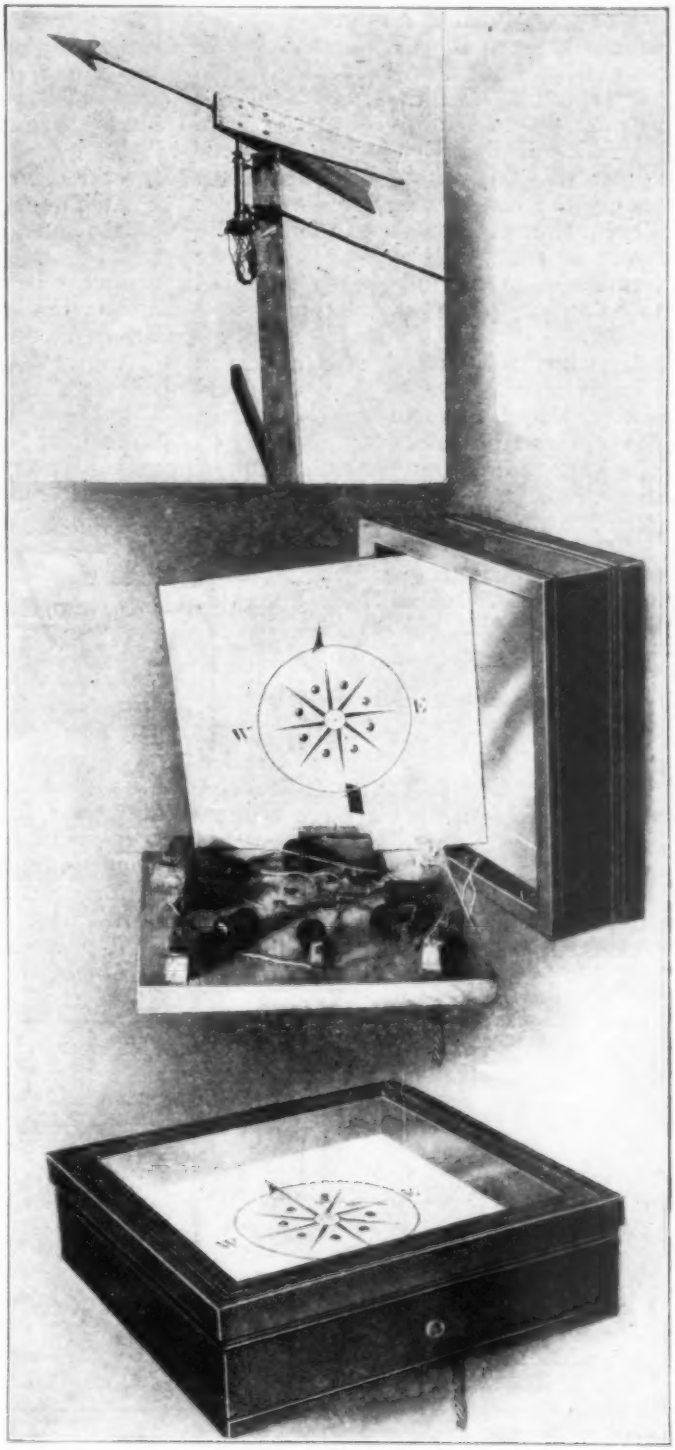
Electrically Operated Indicator for a Wind Vane

The accompanying photograph shows a wind vane connected with electric wires to an instrument at considerable distance which indicates by means of a magnetic needle the direction of the wind. The bearings of the vane consist of the head of a wornout bicycle. A ½-in. iron pipe extends from the vane and is held in place by the clamp originally used to secure the handle bar of the bicycle. In place of the forks is attached an eight-cylinder gas engine timer which is slightly altered in such a manner that the brush is at all times in contact, and when pointing between two contacts connects them both. Nine wires run from the timer, one from each of the eight contacts, and one, which serves as the ground wire, is fastened to the metallic body. The timer is set at such a position that when the vane points directly north, the brush of the timer makes a connection in the middle of a contact. When the timer is held in this position the brush will make connections with each of the contacts as the vane revolves.

The indicating device which is placed in a convenient place in the house consists of eight 4-ohm magnets fastened upon a 1-in. board. These magnets are placed in a 10-in. circle, 45 deg. apart and with their faces pointing toward the center. Covering these is a thin, wood board upon which is fastened a neatly drawn dial resembling a mariner's compass card. This is placed over the magnets in such a manner that there will be a magnet under each of the eight principal points marked on the dial. Over this dial is a magnetic needle or pointer, 6 in. long, perfectly balanced on the end of a standard and above all is placed a cover having a glass top. The eight wires from the timer contacts connect with the outside wires of the eight magnets separately and the inside wires from the magnets connect with the metal brace which holds the magnets in place. A wire is then connected from the metal

brace to a push button, two or three cells of dry battery and to the ground wire in connection with the timer. The wires are connected in such a manner that when the vane is pointing in a certain direction the battery will be connected in series with the coil under that part of the dial representing the direction in which the vane is pointing, thus magnetizing the core of the magnet which attracts the opposite pole of the needle toward the face of the magnet and indicating the way the wind is blowing. The pointer end of the needle is painted black.

If the vane points in such a direction that the timer brush connects two contacts, two magnets will be magnetized and the needle will point midway between the two lines represented on the dial, thus giving 16 different directions. Around the pointer end of the needle is wound a fine copper wire, one end of which extends down to about $\frac{1}{32}$ in. of the dial. This wire holds the needle in place when the pointer end is directly over the magnet attracting it; the magnet causing the needle to "dip" will bring the wire in contact with the paper dial. Without this attachment, the needle would swing a few seconds before coming to a standstill.



The Wind Vane, Magnets and Indicator

The vane itself is easily constructed as can be seen in the illustration. It should be about 6 ft. long to give the best results. The magnets used can be purchased from any electrical store in pairs which are called "instrument magnets." Any automobile garage can supply the timer and an old valueless bicycle frame is not hard to find. The cover is easily made from a picture frame with four small boards arranged to take the place of the picture as shown.

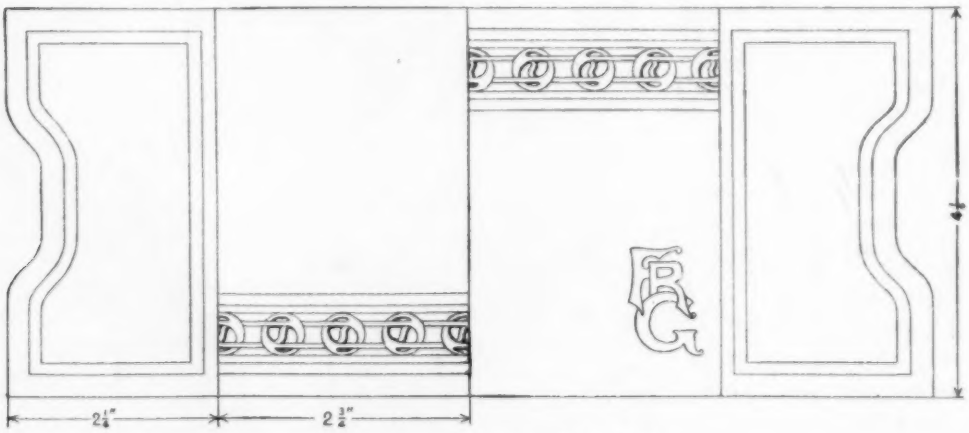
The outfit is valuable to a person who is situated where a vane could not be placed so as to be seen from a window and especially at night when it is hard to determine the direction of the wind. By simply pressing the push button on the side of the cover, the needle will instantly point to the part of the dial from which the wind is blowing.—Contributed by James L. Blackmer, Buffalo, N. Y.

A Home-Made Floor Polisher

An inexpensive floor polisher can be made as follows: Secure a wooden box with a base 8 by 12 in. and about 6 in. high, also a piece of new carpet, 14 by 18 in. Cut 3-in. squares out of the four corners of the carpet and place the box squarely on it. Turn three of the flaps of the carpet up and tack them securely to the sides of the box. Before tacking the fourth side, fold a couple of newspapers to the right size and shove them in between the carpet and the bottom of the box for a cushion. Fill the box with any handy ballast, making it heavy or light, according to who is going to use it, and securely nail on the top of the box. The handle can be made from an old broom handle the whole of which will be none too long. Drive a heavy screweye into the big end of the handle and fasten to the polisher by a staple driven through the eye into the center of the cover, thus making a universal joint. The size of the box given here is the best although any size near that, if not too high, will answer the purpose just as well. The box is pushed or pulled over the floor and the padded side will produce a fine polish.

How to Make a Lady's Card-Case

A card-case such as is shown here makes a very appropriate present for any lady. To make it, secure a piece of "ooze" calf skin leather 4½ by 10½ in. The one shown in the accompanying picture was made of a rich tan ooze of light weight and was lined with a grey-green goat skin. The design was stenciled and the open parts backed with a green silk plush having a rather heavy nap. The lining of goat skin need not cover more than the central part—not the flies. A piece 4½ by 5



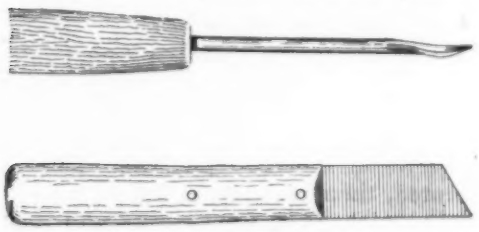
Design for the Cover of Lady's Card-Case

in. will be sufficient. A piece of plush 1¼ by 6 in. will be enough for the two sides.

Begin work by shaping the larger piece of leather as shown in the drawing. Allow a little margin at the top and bottom, however, to permit trimming the edges slightly after the parts have been sewed together. A knife or a pair of scissors will do to cut the leather with, though a special knife, called a chip carving knife, is most satisfactory.

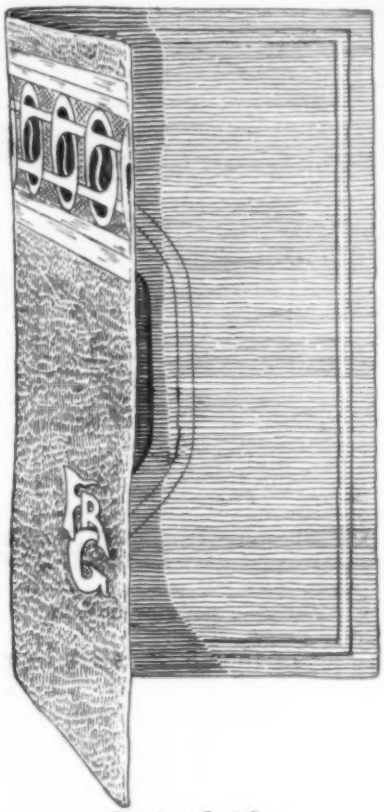
The next thing is to put in the marks for the outline of the designs and the borders. A tool having a point shaped as in the illustration is commonly used. It is called a modeling tool for leather and may be purchased, or, one can be made from an ordinary nut pick by taking off the sharpness with fine emery paper so that it will not cut the leather. To work these outlines, first moisten the leather on the back with as much water as it will take and still not show through on the face side. Place the leather on some level, non-absorbent surface and with the tool—and a straightedge on the straight lines—indent the leather as shown. The easiest way is to place the paper pattern on the leather and mark on the paper. The indentations will be transferred without the necessity of putting any lines on the leather.

With the knife cut out the stencils as shown. Paste the silk plush to the inner side, being careful not to get any of the paste so far out that it will show. A good leather paste will be required.



Leather Tools

Next place the lining, fold the flies along the lines indicated in the drawing. Hold the parts together and stitch them on a sewing-machine. An ordinary sewing-machine will do if a good stout needle is used. A silk thread that will match the leather should be used. Keep the ooze side of the lining



Complete Card-Case

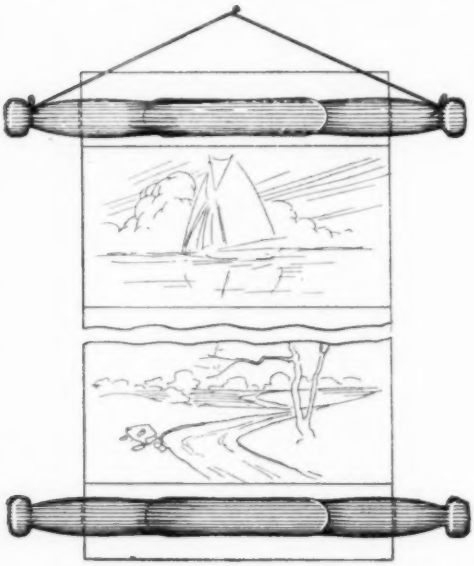
out so that it will show, rather than the smooth side. With the knife and straightedge trim off the surplus material at the top and bottom and the book is ready for use.

Home-Made Fire Extinguisher

Dissolve 20 lb. of common salt and 10 lb. of sal ammoniac in 7 gal. of water, and put the solution in thin glass bottles, cork tightly and seal to prevent evaporation. The bottles should hold about 1 qt. If a fire breaks out, throw one of the bottles in or near the flames, or break off the neck and scatter the contents on the fire. It may be necessary to use several bottles to quench the flames.

Drying Films

The drying of photographic film in full lengths without scratching or curling is quite difficult. Various devices are used to keep the film straight, and



Pins Keep the Film Straight

push pins or thumb tacks are supplied with almost all of them. The illustration shows a simple and inexpensive device constructed of common wood clothespins without any metal pins to come in contact with the film and cause rust streaks. A pair of pins are fastened at each end of the film by pushing one pin over the other which in turn is clamped on the film. A string tied to the heads of one pair of pins provides a way to hang the whole on a nail. The lower pair of pins makes a weight to keep the film straight.—Contributed by J. Mac Gregor, Montreal, Canada.

Grooved Pulley Made from Sheet Tin

A grooved pulley which will run true and carry a round belt may be made without the use of other tools than a compass and pair of shears, with a drill or punch for making two rivet holes.

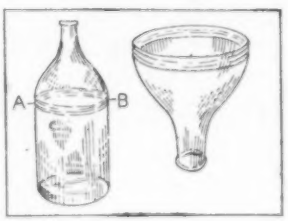
Lay off a circle on the tin, of the diameter desired for the bottom of the groove. Then lay off a concentric circle of ¼ in. greater radius. Cut out along the lines of the large circle. On the line of the small circle mark with a prick punch or nail a series of slight dents, about ¼ in. apart, all the way around. Now make cuts from the line of the large circle to these dents, stopping when the shears give the little "click" on entering the dent. Bend the little tongues thus formed alternately to the right and left, then by shaping them with some care you will have a good running surface for the belt. It will not make any difference if there are more tongues on one side than the other, or if they are not equally spaced, within reason.

For the hub, solder or rivet a "handle" across the center hole and drill a hole through it of the same size as the center hole. With the help of solder a grooved pulley which will answer almost every experimental purpose may be made, and it is remarkable with how slight care a perfectly true wheel may be made in this manner.

The same principle might in some way be applied to gear-wheels, for light and temporary use.—Contributed by C. W. Nieman, New York City.

An Emergency Glass Funnel

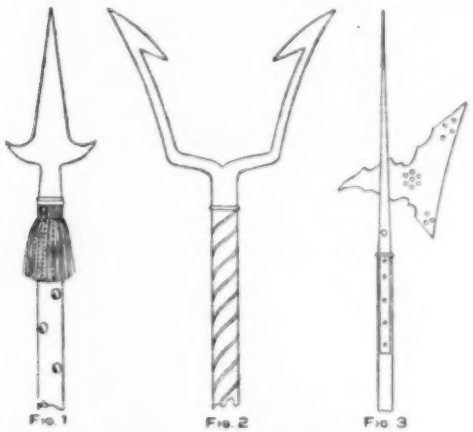
Secure a glass bottle having a small neck and tie a string saturated in kerosene around the outside at A and B as shown in the sketch. Light the string and allow it to burn until the glass is heated, then plunge the bottle quickly into water. The top or neck will then come off easily. The sharp edges are ground or filed off smooth. This will make a good emergency funnel which serves the purpose well for filling wide necked bottles.—Contributed by Jos. W. Sorenson, Everett, Wash.



Imitation Arms and Armor—Part IV

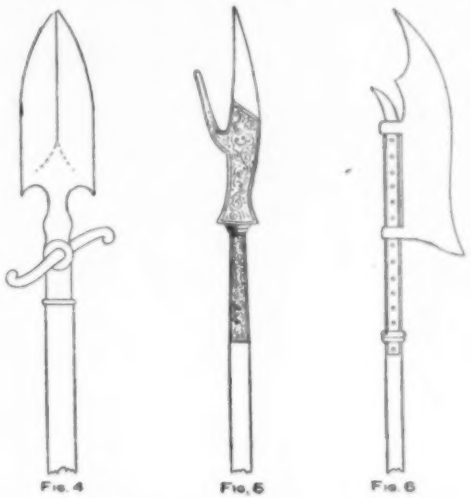
The ancient arms of defense as shown in the accompanying illustrations make good ornaments for the den if they are cut from wood and finished in imitation of the real weapon. The designs shown represent original arms of the sixteenth and seventeenth centuries. As they are the genuine reproductions, each article can be labelled with the name, adding to each piece interest and value, says the English Mechanic, London.

Each weapon is cut from wood. The blades of the axes and the cutting edges of the swords are dressed down and finished with sandpaper and the steel parts represented by covering the wood with tinfoil. When putting on the tinfoil, brush a thin coat of glue on the part to be covered and quickly lay on the foil. If a cutting edge is to be covered the tinfoil on one side of the blade must overlap the edge which is pasted on the opposite side. The other side is then covered with the tinfoil of a size that will not quite cover to the cutting edge. After laying the foil and allowing time for the glue to dry, wipe the surface with light strokes up and down several times using a soft piece of cloth.



Partisan, Fork and Halberd

A French partisan of the sixteenth century is shown in Fig. 1. The weapon is 6½ ft. long with a round handle having the same circumference for the entire length which is covered with crimson cloth or velvet and studded all over with round-headed brass nails. The spear head is of steel about 15 in. long from the point where it is attached to the handle. The widest part of the blade from spear to spear is about 8 in. The length of the tassel or fringe is about 4 in.



Spontoon, Glaive and Voulge

Figure 2 shows a German military fork of the sixteenth century, the length of which is about 5 ft. with a handle of wood bound with heavy cord in a spiral form and the whole painted a dark color. The entire length of the fork from the handle to the points is about 10 in., and is covered with tinfoil in imitation of steel.

A Swiss halberd of the sixteenth century is shown in Fig. 3. This combination of an axe and spear is about 7 ft. long from the point of the spear to the end of the handle, which is square. The spear and axe is of steel with a handle of plain dark wood. The holes in the axe can be bored or burned out with red-hot iron rods, the holes being about ¼ in. in diameter.

Figure 4 shows an Austrian officers' spontoon, used about the seventeenth century. It is about 6 ft. long with a round wooden handle. The spear head

from its point to where fixed on the handle is about 9 in. long. The edges are sharp. The cross bar which runs through the lower end of the spear can

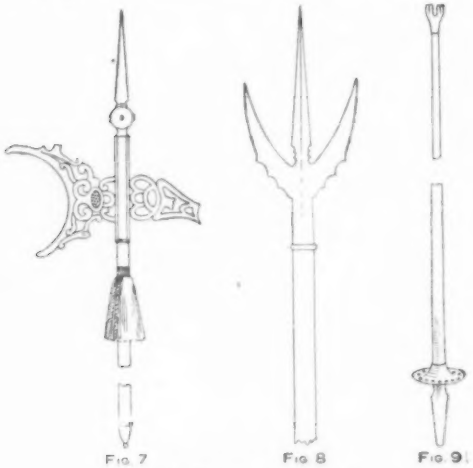


Fig. 7 Fig. 8 Fig. 9

Halberd, Ranseur and Lance

be made in two pieces and glued into a hole on each side. The length of this bar is about 5 in. The small circular plate through which the bar is fixed can be cut from a piece of cardboard and glued on the wooden spear.

A gisarm or glaive, used by Italians in the sixteenth century, is shown in Fig. 5. The entire length is about 6½ ft. The blade is engraved steel with a length of metal work from the point of the spear to where it joins the handle or staff of about 18 in. It has a round wooden handle painted black or dark brown. The engraved work must be carved in the wood and when putting the tinfoil on, press it well into the carved depressions.

Figure 6 shows a Saxon voulge of the sixteenth century, 6 ft. long, with a round wood handle and a steel axe or blade, sharp on the outer edge and held to the handle by two steel bands, which are a part of the axe. The bands can be made of cardboard and glued on to the wood axe. These bands can be made very strong by reinforcing the cardboard with a piece of canvas. A small curved spear point is carved from a piece of wood, covered with tinfoil and fastened on the end of the handle as shown. The band of metal on the side is cut from cardboard, covered with tinfoil and fastened on with round-headed brass or steel nails.

A very handsome weapon is the German halberd of the sixteenth century which is shown in Fig. 7. The entire length is about 6½ ft., with a round wooden handle fitted at the lower end with a steel ornament. The length of the spear point to the lower end where it joins on to the handle is 14 in. The extreme width of the axe is 16 or 17 in. The outer and inner edges of the crescent-shaped part of the axe are sharp. This axe is cut out with a scroll or keyhole saw and covered with tinfoil.

An Italian ranseur of the sixteenth century is shown in Fig. 8. This weapon is about 6 ft. long with a round staff or handle. The entire length of the metal part from the point of the spear to where it joins the staff is 15 in. The spear is steel, sharp on the outer edges.

Figure 9 shows a tilting lance with vamplate used in tournaments in the sixteenth century. The wood pole is covered with cloth or painted a dark color. At the end is a four-pronged piece of steel. The vamplate can be made of cardboard covered with tinfoil to represent steel and studded with brass nails. The extreme length is 9 ft.

The tassels or fringe used in decorating the handles can be made from a few inches of worsted fringe, about 4 in. long and wound around the handle or staff twice and fastened with brass-headed nails.

An Emergency Babbitt Ladle

Take an old stove leg and rivet a handle on it and then break the piece off which fastens on the stove. The large and rounding part of the leg makes the bowl of the ladle. This ladle will be found convenient for melting babbitt or lead.—Contributed by R. H. Workman, Loudonville, Ohio.

OLD-TIME MAGIC—PART XI

Removing 36 Cannon Balls from a Handbag

The magician produces a small handbag and informs the audience that he has it filled with 20-lb. cannon balls. He opens up the bag and takes out a ball which he passes to the audience

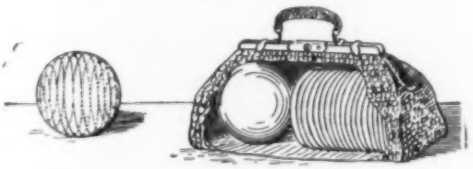


Fig. 1 Fig. 2

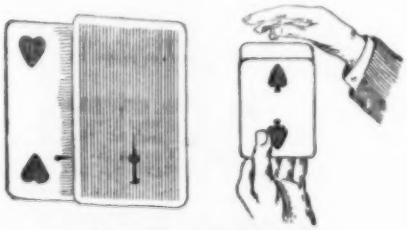
Balls Made of Spring Wire

for examination. The ball is found to be the genuine article. He makes a few passes with the wand and produces another ball, and so on until 36 of them lie on the floor.

In reality the first ball, which is the one examined, is the real cannon ball, the others are spiral-spherical springs covered with black cloth (Fig. 1). These balls can be pressed together in flat disks and put in the bag, Fig. 2, without taking up any great amount of space. When the spring is released it will fill out the black cloth to represent a cannon ball that cannot be distinguished from the real article.—Contributed by J. F. Campbell, Somerville, Mass.

A Rising Card Trick

A rising card trick can be accomplished with very little skill by using the simple device illustrated. The only



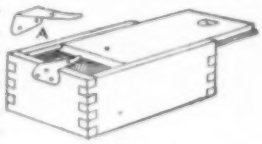
Card Slips from the Pack

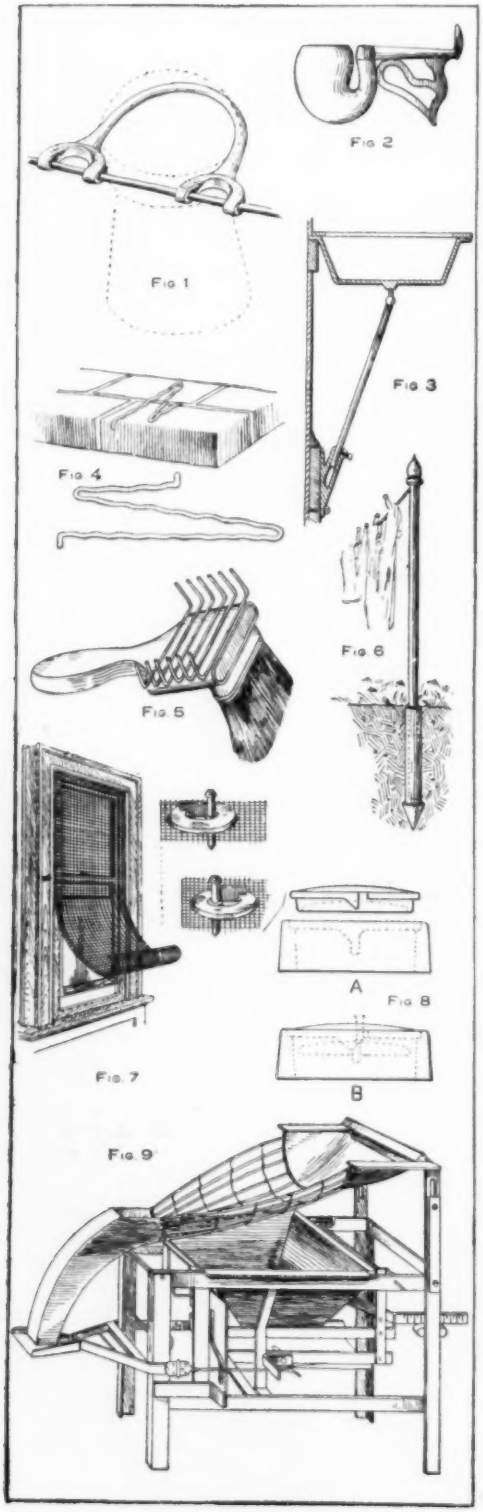
things needed are four ordinary playing cards and a short rubber band. Pass one end of the rubber band through one card and the other end through the other card, as shown in the illustration, drawing the cards close together and fastening the ends by putting a pin through them. The remaining two cards are pasted to the first two so as to conceal the pins and ends of the rubber band.

Put the cards with the rubber band in a pack of cards; take any other card from the pack and show it to the audience in such a way that you do not see and know the card shown. Return the card to the pack, but be sure and place it between the cards tied together with the rubber band. Grasp the pack between your thumb and finger tightly at first, and by gradually loosening your hold the card previously shown to the audience will slowly rise out of the pack.—Contributed by Tomi O'Kawara, San Francisco, Cal.

Sliding Box Cover Fastener

While traveling through the country as a watchmaker I found it quite convenient to keep my small drills, taps, small brooches, etc., in boxes having a sliding cover. To keep the contents from spilling or getting mixed in my case I used a small fastener as shown in the accompanying illustration. The fastener is made of steel or brass and fastened by means of small screws or tacks on the outside of the box. A hole is drilled on the upper part to receive the pin that is driven into the sliding cover. This pin should not stick out beyond the thickness of the spring, which is bent up at the point so the pin will freely pass under it. The pin can be driven through the cover to prevent it from being pulled entirely out of the box.—Contributed by Herm Grabemann, Milwaukee, Wis.





RECENT

DEVICE FOR FASTENING WIRES TO INSULATORS.—A short length of wire twisted around the glass insulator has sufficed for many years in stringing telegraph and telephone wires from pole to pole, but the device designated as Fig. 1 is designed to take the place of this old method. It is shaped as shown in the drawing, the ends of the half circle it forms bending back over the wire and catching into spurs that are likewise bent back.

PIPE WITH CHIN REST.—The curious pipe illustrated in Fig. 2 is designed to remove all strain from the teeth in holding it. The bracket underneath the stem is curved to conform with the contour of the chin, and the upward projection at the end of the mouth-piece rests behind the upper row of teeth. This keeps the pipe in the mouth without the necessity of gripping it between the teeth, a procedure which wears them down and disfigures, if the user is an inveterate smoker.

ADJUSTABLE SUPPORT FOR SINKS.—A sink with an adjustable support which will permit its being raised to such a position that the outer side will be higher than the inner is shown in Fig. 3. Such an arrangement has many good features, especially for some kinds of laboratory work.

WIRE BOND FOR BRICK.—Figure 4 is a brick bond consisting of an N-shaped length of galvanized-iron wire. Placed across the top of a row of brick it becomes fast in the mortar, which works its way around the crimping and makes it practically impossible for the brick to spread. The hooked end prevents the separation of the inner and outer walls.

CARPET-SWEEPER CLEANER.—Cleaning the brushes of carpet sweepers, a difficult task under any condition, is made much easier by the use of the device illustrated in Fig. 5. The brush part is used for cleaning the spaces between the rows of bristles, while the wire teeth on the back are drawn through the bristles to remove string, thread and hair.

REMOVABLE CLOTHES POST OF STEEL.—The post and socket base of the clothes pole shown in Fig. 6 are separable. The latter, which is 2½ ft. long, is driven into the ground, a driving cap being provided for the purpose. It remains in position in the ground at all times, being so low that a lawn-mower will not strike it. The post is inserted when required and removed when the clothes are taken in.

FRAMELESS WINDOW-SCREENS.—A frameless screen for windows is made possible by means of the eyelets and lock pins shown in two of the drawings designated as Fig. 7. The screens themselves are supplied in wire or of any textile of suitable mesh. The lock pins are tacked onto the framing of the window inside the room, and have a revolving eccentric locking and unlocking device by which the screen is fastened to the frame at any point. The eyelets which fit into the lock pins are fastened to the screen by means of tongues. The two small drawings show how the locking device of the pins stretch the screen. In the lower of these drawings the stretching device is turned in, but when it is turned out, as shown in the upper drawing, the screen is stretched. The screen may be removed or put in place by turning the locking device in.

IMPROVED MAN-HOLE COVER.—The man-hole cover shown in Fig. 8 screws into the hole, and consequently is self locking and at the same time easy to remove by twisting it around. Such a cover cannot be tipped up or dislodged by the passing of heavy traffic.

DEVICE SEPARATES YOLKS AND WHITES AND CASTS OUT BAD EGGS.—The somewhat unique device shown in Fig. 9 not only separates the yolks from whites, but casts out the bad eggs. It is designed for use in pastry bakeries and other concerns where eggs are used in large quantities, and comprises a screening chute for separating the whites from the yolks, a counterweighted tray receiving the whites from the separating chute and automatically

PATENTS

discharging defective eggs. When the egg is bad the white and yolk cannot be separated by the chute, and fall upon the counterweighted tray, which rocks to an open position and allows the defective egg to escape.

ADJUSTABLE CURTAIN BRACKET.—The curtain bracket shown in Fig. 10 has a supporting arm which engages with a series of slots which makes possible its adjustment throughout a considerable range of height. As many as 10 slots are provided and these are about an inch apart.

GAME-CARRYING COAT FOR HUNTERS.—The lower part of the hunting coat shown in Fig. 11 is one big pocket for the carrying of game. The game receptacle extends all the way around, and on each side a short distance under the arm-hole is an opening through which to pass the game. No matter how full the coat may become there is no drag on any part of it, as reinforcing bands throw the weight on the shoulders alone. The lining of the coat is waterproof so that blood or other stain cannot find its way through. When desired, this lining may be turned inside out for washing.

FOLDING DECOYS.—The decoy shown in Fig. 12 is double-folding, and as such can be packed in a much smaller space than the ordinary decoy. The fact that the head is riveted onto the neck makes possible its adjustment to any position the hunter desires.

A BELT PHONOGRAPH.—The musical impressions for reproduction on this new type of phonograph (Fig. 13) are contained on an endless belt that runs on rollers, one of which is fixed just under the sound box of the machine while the other is near the bottom of the frame. The belt record is said to make possible a much longer selection in one unit than the disc or cylindrical types.

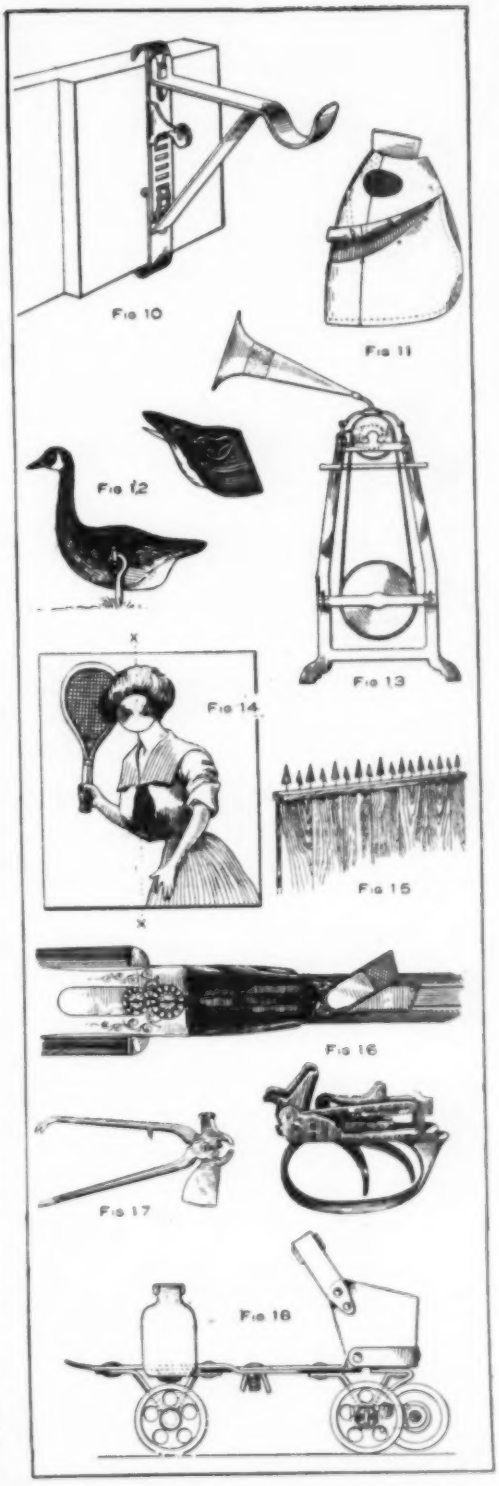
UNIQUE ADVERTISING DEVICE.—The drawing designated as Fig. 14 appears very incomplete because of the blank space where the face should be, but were you to approach and look into it you would see your own face reduced to just the right size to conform to the proportions of the figure. The blank space is occupied by a lens and a reflector, so arranged that the face of the person looking into it will appear as the face of the figure.

CAT-GUARD FOR BACK FENCES.—The fringe of spear heads on the top of the fence shown in Fig. 15, presumably the idea of an inventor often disturbed by feline concerts at night, is designed to keep cats from converting the top of the back fence into a promenade. It likewise prevents cats from gaining an entrance to the yard from the alley or surrounding yards.

GUN WITH DETACHABLE TRIGGER-PLATE.—So many fatalities have been caused by the accidental discharge of guns that an English concern is manufacturing a detachable trigger-plate. Both locks are mounted upon the trigger plate with the trigger guard and triggers underneath. The plate is held in position in the gun by means of a fixed engagement at the front and a bolt in a recess at the rear. The bolt is attached to a hand lever, fitted beneath the stock as shown in Fig. 16.

A TOOL OF MANY USES.—A recently patented American combination tool that is much in use is shown in Fig. 17. It measures only 12 in. in length, but can be used as a hatchet, hammer, wire-cutter, pincers, nail-puller, screwdriver, and hole-punch for leather.

BRAKE FOR ROLLER SKATES.—The wheel at the rear of the roller skate shown in Fig. 18 acts as a brake. By raising the front wheels off the skating surface the brake-wheel is depressed upon it, and as its free movement is contested by a friction strip that is forced against it by the raising of the forward part of the skate, the skater is soon brought to a stop.

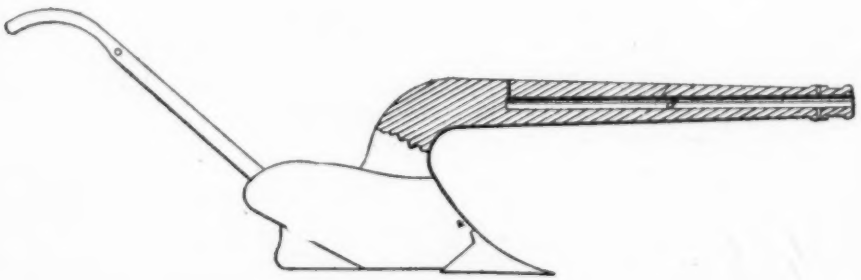


SOME CURIOUS OLD PATENTS

LADIES' HAIR PARTER.—The ladies' hair parter shown in the accompanying illustration was the invention of a man named Meek, who, if true to his name, had probably been patiently parting his wife's hair and wished to be relieved of his duties as ladies' maid. He says in his application for patent:

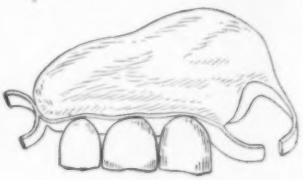
"The object of my invention is to enable a lady to part her own hair straightly or evenly without difficulty. It consists of a yoke of such form as to extend across, or over the crown of the head and rest upon the ears, and having attached to it two parallel guide-pieces of such form and so arranged that when the yoke is placed over the crown the said guide-pieces project forward over the top of the head to the forehead. The space between the said guide-pieces being just wide enough for the passage of a comb and perfectly straight from back to front, the said pieces will guide a comb placed between them in a perfectly straight line, and so enable the front parting of the hair to be made perfectly straight. The rear edge of the yoke also serves as a guide to the comb for the side partings." Patent No. 53,163 was granted for this invention March 13, 1866, and having expired, is now public property, so that all married men acting as ladies' maids may avail themselves of this labor-saving invention and escape the scolding incident to masculine clumsiness.

PLOW CANNON—Expired Patent No. 35,600, granted June 17, 1862, illustrates a curious blending of the arts of peace and war. It was a plow cannon and is shown in the accompanying illustration. The beam of the plow was constructed as a cannon, and to repel an attack in the field all the plowman had to do was to unhitch old Dobbin and touch off the cannon. This might have been a good thing for Indians in the early pioneer days, and a handy tool for feudists. It was patented during the Civil War by two joint inventors of Waterloo, N. Y., but does not seem to have received any special attention by either the War or Agricultural Departments.



Gun Plow—a Relic of Indian Days

THE FIRST DENTAL BRIDGEWORK PATENTED.—In dentistry, the so-called bridgework is a means by which one or more teeth are supported in the gap left between natural teeth by means of a bridge-piece of metal anchored at its ends to the teeth on each side of the gap. The method is popularly supposed to have originated with Mr. Bing, an Englishman, who in 1871 took out British patent No. 167 for the same. This appears, however, to be a mistake, for the records of the United States Patent Office show that one John Allen, of Cincinnati, Ohio, preceded him by 26 years, and took out United States patent No. 4,313, of December 16, 1845, for a similar invention. As seen in the illustration, it shows a dental plate in which three teeth are seated in the plate and the plate has on each side of the teeth clasps which embrace the two sound natural teeth on each side of the gap. This inventor also with a view to curing the facial defect of a fallen-in jaw made his plate with a bulbous projection that held the cheek to the fully rounded youthful contour.



NEW BOOKS

SELF-PROPELLED VEHICLES.—By James E. Homans. (7th Edition, Revised). Cloth, 667 pp.; illus. Price, $2.00. Gives essential details of construction and many important points on successful operation of various types of motor cars. Theo. Audel & Co., New York.

ART OF SIGN PAINTING.—By Frank H. Atkinson. This handsome volume contains 96 designs or layouts and accompanying color notes; 75 alphabets, embracing all standard styles, their modifications and alternates; comprehensive text covering all practical phases of the art and is suitable for every-day reference in the shop. Price $3.00. Frederick J. Drake & Co., Chicago.

THE AIR BRAKE MAGAZINE, an illustrated monthly publication devoted to advancing the air brake art, made its first appearance with the November, 1909, number. It is published at Meadville, Pa., and is 15 cents a copy; $1.50 per year.

LOCOMOTIVE BREAKDOWNS AND THEIR REMEDIES.—By Geo. L. Fowler. Pocket size; illus.; 270 pp. Price, $1.00. Every kind of accident which is likely to occur to a locomotive, including engines of the most modern type, is fully considered and the remedy given in plain language. Norman W. Henly Pub. Co., New York.

THE MODEL VAUDEVILLE THEATRE, How to Construct and Operate It.—By Norman H. Schneider. Paper covers. Price 25 cents. Spon & Chamberlain, New York.